## Motive Power Automation

. . . page 21

## Mechanical Reefer Shop

. . . page 30

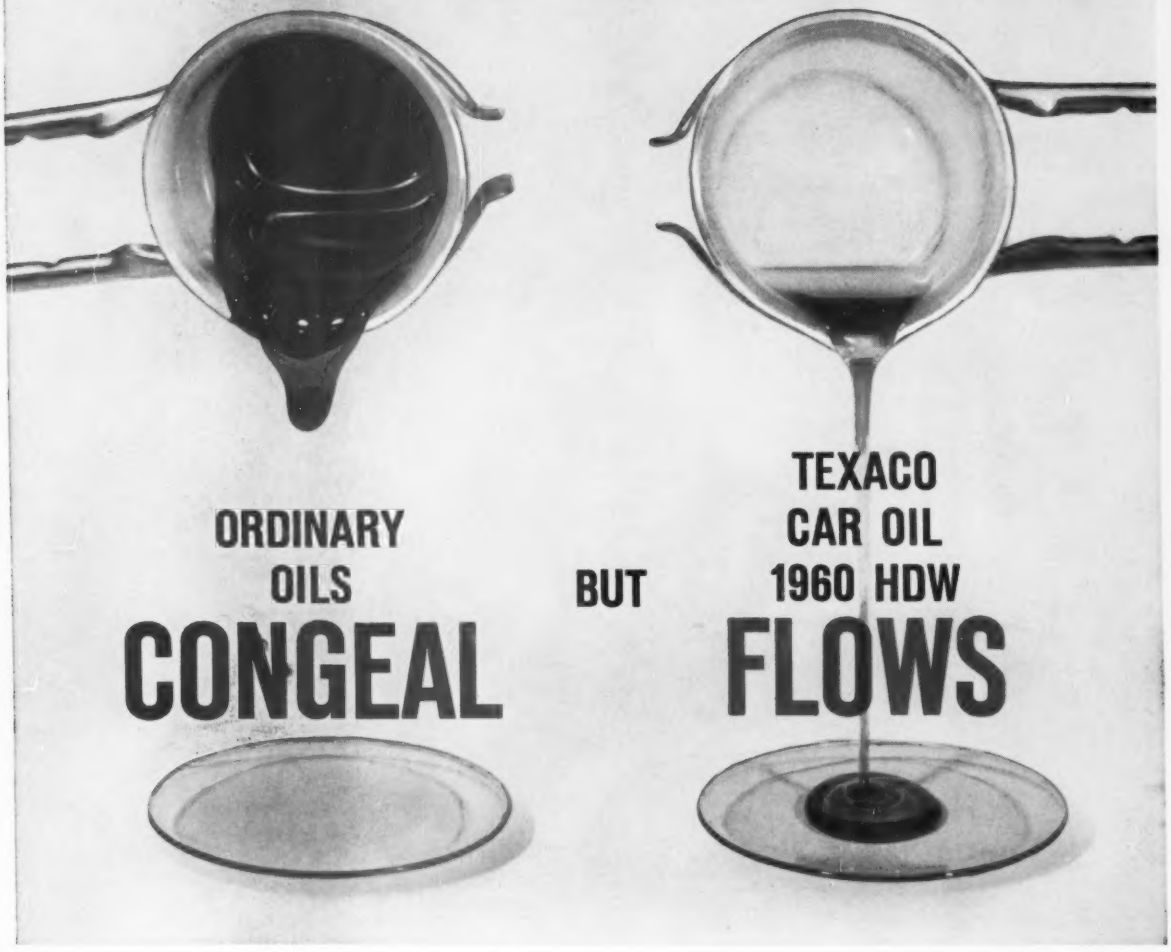
RAILWAY

# LOCOMOTIVES AND CARS

NOVEMBER 1960


First 85-Ton Hopper Cars Are Completed . . . page 25

# AT 35° BELOW ZERO




**FOR IMPROVED WICKABILITY IN WINTER** leading railroads are using Texaco Car Oil 1960 HDW (W is for Winter). This is a special low-viscosity winter grade of Texaco's premium journal bearing lubricant that stays fluid even at –35 F, and starts wicking at lower temperatures than any other car oil you can buy. Texaco Car Oil 1960 HDW gives you a protective lubricating film between journal bearing and axle right from the start, right through the winter. And of course you get the tough, low-wear, low-friction protection that's built into all grades of Texaco Car Oil 1960 HD.

For more information about Texaco Car Oil 1960 HDW, call the nearest Railway Sales Division Office. There's one in Atlanta, Chicago, New York, San Francisco, St. Louis and St. Paul. Or, write:

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Texaco Inc., *Railway Sales Division,* 135 East 42nd Street, New York 17, N. Y.

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# Rewound motors can be upgraded with NECCOBOND field coils by National ... *The Specialists in electric coils/repair service*

Rewinding time is an ideal opportunity to improve performance over that of the original machine . . . with the much more effective insulations available today.

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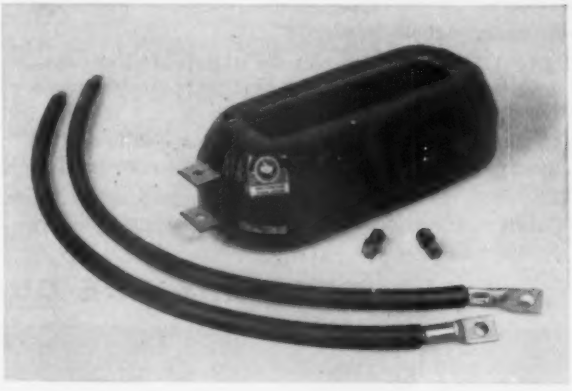
NECCOBOND field coils upgrade performance. Coils operate cooler—insulation lasts longer and is impervious to water, oil, or other sources of trouble.

For more information call our Columbus plant—HUdson 8-1151, or the nearest National field engineer.



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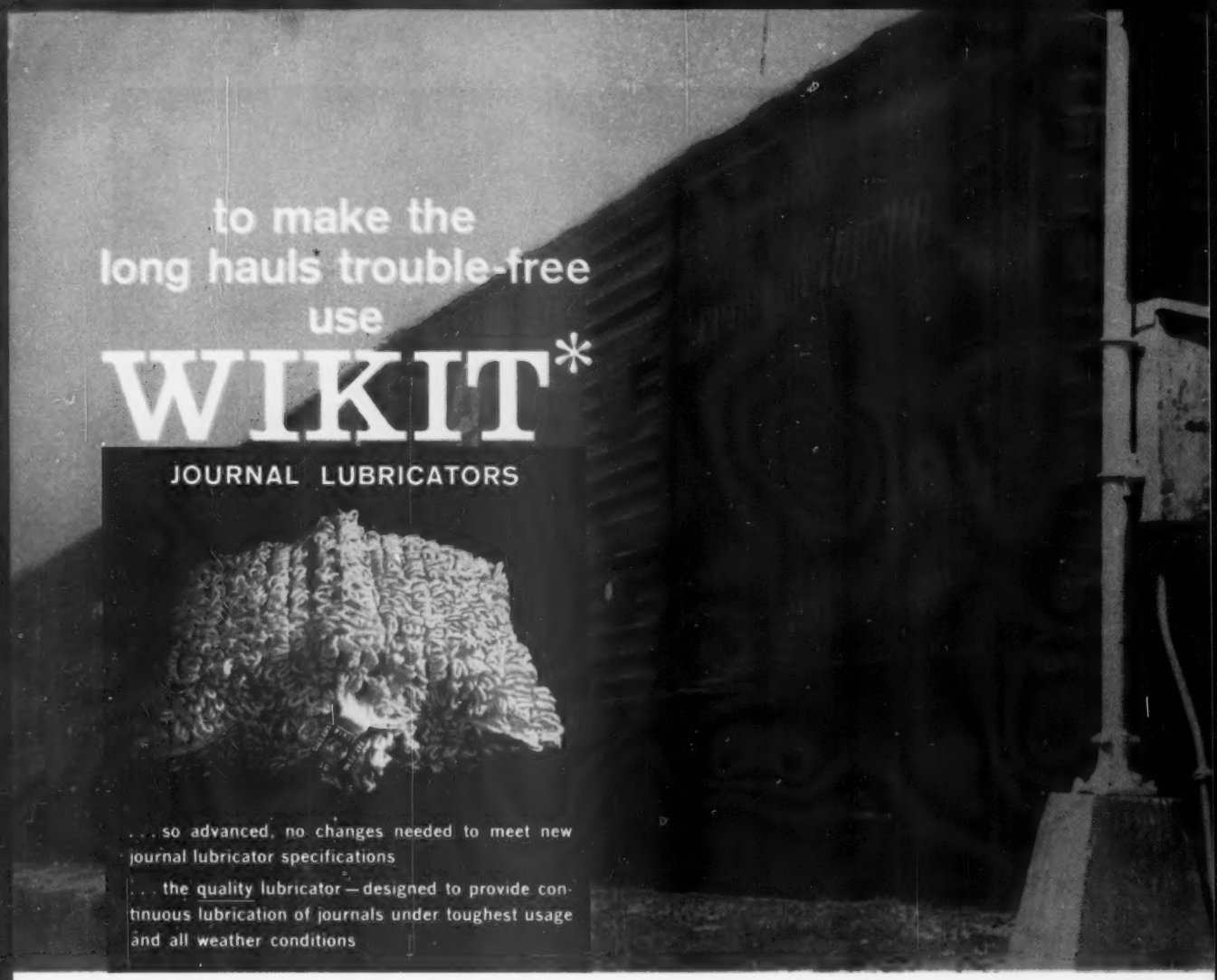


• **Original center wick construction**—provides most direct oil flow to journal. Over-all design assures multi-feed wicking throughout lubricator.

• **LOOP-TITE* jacket**—woven by a patented process, interlocks loop pile in a weave that gives greater tensile strength, more direct oil delivery.

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RAILWAY
# LOCO-MOTIVES AND CARS

America's Oldest Trade Paper
November 1960—Vol. 134, No. 11

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# REPORT FOR NOVEMBER

## TOFC Interchange Rules Submitted for Approval

Rules governing the interchange of trailers and containers have been submitted for letter ballot action of car owners by the AAR Mechanical Division. In submitting the ballot, the division's Arbitration Committee reported that the proposed rules, to be effective January 1, 1961, had been prepared for the following reasons:

- To make trailer owners responsible for, and chargeable with, repairs to their trailers necessitated by ordinary wear and tear in fair service, by safety requirements, by standards of the AAR, and by requirements of regulatory agencies controlling highway movement of such equipment;
- To place responsibility and provide a means of settlement for damage to any trailer occurring through improper handling or improper protection by the handling company;
- To provide an equitable basis for charging repairs and damage;
- To make inspection of trailers for interchange comply with the proposed Code of Rules.

The 185 rules are divided into fifteen sections as follows: conditions governing acceptance and delivery of trailers in interchange; tires and tubes; landing gears; refrigeration and/or heating; accessories and special equipment; damage; ordinary maintenance; repairs and billing; adjustment or transfer of trailers and/or lading; forms and reports; settlement of disputes and revision of rules; AAR inspection practices; settlement for destroyed or badly damaged trailers; locations, markings, etc., and conditions of acceptance.

The letter ballot was returnable to the Mechanical Division by November 3.

## ASME Railroad Division Meets December 1-2

E. P. Gangewere, president of the Reading, will be the speaker at the luncheon of the Railroad Division during the annual meeting of the American Society of Mechanical Engineers scheduled for November 27-December 2 at the Statler Hilton Hotel, New York. At an afternoon session on December 1, W. M. Keller, vice-president research, AAR, will discuss Mechanical Engineering Progress on Russian Railroads. Supplementary comments will be made by J. F. Nash, vice-president—operations, New York Central; J. W. Horine, electrical engineer, Pennsylvania, and C. D. Buford, vice-president, Operations and Maintenance Department, AAR, who also were on the team of U. S. railroad officers who visited Russia last fall (RL&C, Sept. 1960, p 9).

The program for the Railroad Division sessions follows.

THURSDAY, DECEMBER 1

*2:30 p.m.*

Progress in Railway Mechanical Engineering.

Mechanical Engineering Progress on Russian Railroads—W. M. Keller, followed by supplementary comments by Messrs, Nash, Horine, and Buford.

*(Continued on page 8)*

## TIME SAVING IDEAS FOR NOVEMBER

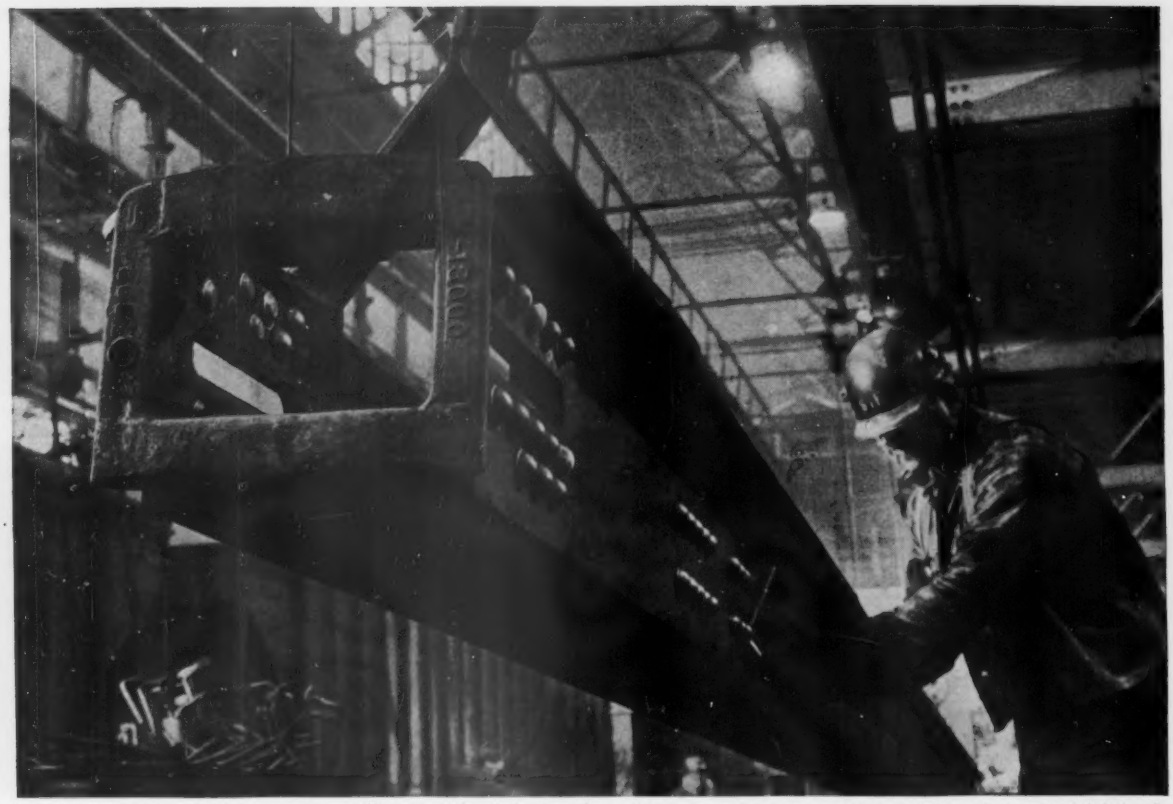
MOTIVE POWER AND CAR



ELECTRICAL



DEPARTMENTS



Inspector tests rivets at bolster center brace. When tapped with hammer, loose rivets cause vibrations in special tool shown in inspector's left hand.

# QUALITY CONTROL . . .

## *What does it mean to a car-building program?*

Freight-car building at Bethlehem's shops is an assembly-line process in which the parts are separately built up, then moved to the erecting tracks for assembly into finished cars. Since one poorly made part could spoil a whole car, Bethlehem's quality control engineers are in the shops at all times, checking on every aspect of construction, helping to overcome difficulties, even suggesting improvements.

Through our own quality control program, Bethlehem has been able to reduce "foreign" inspection substantially, thus saving our customers money. Our goal is to maintain such a standard of excellence that foreign inspection can be eliminated entirely. We would like to demonstrate our ideas of quality on your next order for hopper, gondola or flat cars. You suggest the time and place.

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Now, you get more miles *under a locomotive* out of traction motors rebuilt by your General Electric Service Shop. A new repair product, better than any previously available, offers you top performance under virtually any operating condition.

Commutating coils are now cured by an exclusive bag-molding process to provide a heat-resistant, mechanically tough structure. Armatures are rewound with factory furnished coils, epoxy impregnated in three vacuum pressure cycles to effectively tighten the unit, and roll-cured to provide uniform insulation thickness and eliminate surface drips.

The entire winding has been re-engineered to assure maximum heat transfer through the insulation system so that the repair product will run cooler and give you more miles in service.

*Long motor mileage is not solely a function of the insulation system, however.* To assure top performance, all the mechanical components of the motor must be brought back to factory-fresh condition. For instance, the armature has to be dynamically balanced; bearing and axle fits have to be built up and re-machined to renew their original close tolerances.

To learn how you can get more miles per rewind and better all-round performance from your remanufactured traction motors, call your General Electric Service Sales Engineer or write for Bulletin GEA-7114, General Electric Co., Section 801-02, Schenectady 5, New York.

*Progress Is Our Most Important Product*

GENERAL ELECTRIC

*(Continued from page 5)*

FRIDAY, DECEMBER 2

*9:30 a.m.*

Operational Experience with the C&O Railvan—C. J. Sennhauser, design and development engineer, C&O.

A New Concept—Push-Pull Suburban Cars—William Van Der Sluys, associate director of research and development, Pullman-Standard.

Effect of Design of Classification Yards in Reducing Lading Damage—A. V. Dasburg, manager, Yard and Terminal Development, General Railway Signal Co.

*2:30 p.m.*

Tests of Cushioned Meat Racks in Refrigerator Car Service,—W. H. Cyr, chief mechanical engineer, Canadian National.

Strength Requirements for Special Cars to Transport 40-ft Trailers—H. L. Decker, mechanical engineer, Pennsylvania.

The Design and Development of the G. E. FVDL-16 Locomotive Diesel Engine—J. C. Rhoades, manager, Railroad Locomotive Engines, General Electric Co.

---

The Railroad Division, in 1961, will again sponsor a Spring Railroad Conference jointly with the Land Transportation Committee of the AIEE. The Conference is scheduled for April 20 and 21 at the Sir Francis Drake Hotel, San Francisco, Cal.

## E-L Realigns Shop Facilities

Formation of the Erie-Lackawanna Railroad on October 17 was accompanied by some changes in the equipment maintenance facilities formerly operated, respectively, by the Delaware, Lackawanna & Western and the Erie. C. K. James, formerly superintendent of motive power of the Erie, is superintendent of motive power at mechanical department headquarters in the Cleveland, Ohio, location of the E-L general offices.

Heavy locomotive repairs will be made at the former Erie shops at Marion, Ohio, and Hornell, N. Y., and in the former Lackawanna shop at Scranton, Pa. Heavy passenger-car repairs will be handled at the Lackawanna's Keyser Valley shop near Scranton.

Two years ago, when the two roads were already studying possible merger (RL&C, November 1959, p 7), the Erie opened a shop at Meadville, Pa., designed to maintain the freight car fleets of both roads. This facility will handle all heavy freight-car repairs. Car repairs in the New York terminal area are to be made at Erie's Coxton Yard just west of Hoboken, N.J., the E-L's eastern terminus.

## ICC Examiner Favors Run Board Elimination

Some tank cars without side running boards will comply with the Safety Appliance Acts, examiners for Division 3 of the Interstate Commerce Commission decided recently. Notice of this decision was served on interested parties on September 27. This latest action may bring to a close three years of argument involving the ICC, the Union Tank Car Co., and the Railway Labor Executives Association. A final ICC order may not be issued for some time.

Car involved is the UTL "Hot Dog" (HD) design from which center sill, side running boards, side handrails, and horizontal handrails at tops of sill steps were eliminated in the initial model (RL&C, March 1958, p. 31). On this car, introduced in 1957, platforms were provided around each end of the tank and railings at the bolsters prevented trainmen from trying to go from end to end of the car.

UTL's original petition for a fourth tank car arrangement under the Safety Appliance Act to cover this HD car was denied without hearing early in 1958. Following reconsideration, an examiner again recommended denial after hearing in April 1958. Union Tank then redesigned its car to counter objections raised by the RLEA. This modified HD car had side railings in place of the conventional running boards (RL&C, June 1959, p. 10), horizontal handholds at the sill steps, and a redesigned brake release valve handle more convenient to reach from the side of the car. The RLEA had contended that men could not go from end to end of the HD car and that trainmen were likely to get too close to the car between the bolsters so that they might be injured or run over by the wheels while trying to release stuck brakes. RLEA finally dropped its arguments concerning the need for men to go from end to end of the car.

On April 1959, Union Tank filed an amendment to its 1957 petition which covered the modified HD design. This petition received favorable action by Division 3 in July 1959. Following RLEA petitions for reconsideration and, finally, for outright suspension of this Division 3 action, the ICC first denied a review hearing and then, on February 29, 1960, vacated the orders of 1959 which had legalized the modified HD arrangement. The proceeding was then reopened for additional hearings.

Although the proposed handrail was to be installed in the same location as the low side running boards on conventional tank cars, the RLEA still contended that it could not give a man a bracing spot or place for gripping the car equivalent to that

*(Continued on page 51)*


**Railings would take place of running boards on HD cars if ICC concurs with its examiner.**

## Orders and Inquiries for New Equipment

Placed Since Closing of Oct. Issue

### Locomotive Orders

BURLINGTON. *Electro-Motive.* 36 2,000-hp GP20 road switchers. Included in 1961 equipment program.

### Freight-Car Orders

ATLANTA & WEST POINT. *Pullman-Standard:* 30 50-ft, 50-ton box cars. Ten equipped with special loading devices. For delivery this month.

BURLINGTON. (1961 equipment program). *Company shops:* 600 box cars, including 250 insulated and 50 plain equipped with lading protection devices and cushion underframes; 350 covered hopper cars; 50 bulkhead flat cars, and 50 flats. *General American.* 50 covered hoppers (Airslide and Dry-Flo). COLORADO & SOUTHERN and FORT WORTH & DENVER (Burlington affiliates). *Company shops.* 25 50-ft, 70-ton insulated box cars; 150 70-ton all-steel hopper cars, and 100 70-ton mill type steel gondola cars. General American. 10 Dry-Flo covered hoppers.

CANADIAN NATIONAL. *Dominion Steel.* 50 40-ton, 40-ft steel flat cars.

LOUISVILLE & NASHVILLE. *American Car & Fdry.* 40 of 50-ft double-door box cars listed in October issue equipped with Sparton Easy Loaders.

NORTH AMERICAN CAR. *Pullman-Standard.* 123 Lo-Dek piggyback flat cars. Floor level only 31 in. above rail—almost a foot lower than most other piggyback cars. 116 to be leased to NYC for auto service; 7 to WM. *General American.* 7 70-ton flats, to be converted to multi-level auto carriers by addition of Whitehead & Kales auto racks. For delivery this month.

NORTHERN PACIFIC. *Company shops:* 150 50-ft roller-bearing-equipped RBL's. Completed in October. 500 50-ft double-door box cars equipped with roller bearings and Nailable Steel floors. To be completed in February.

PITTSBURGH & LAKE ERIE. *Despatch shops.* 550 70-ton hoppers. Deliveries begin in October.

SEABOARD AIR LINE. *Thrall Car:* 25 53-ft, 90-ton, roller-bearing equipped flat cars. Each car to carry eight 20,000-lb coils of tinplate under specially designed steel cover. Total cost, $387,000. Deliveries to begin this month.

TRAILER TRAIN. *ACF; Bethlehem Steel; Pullman-Standard.* 800 85-ft piggyback flat cars equipped with roller bearings. *Pullman-Standard.* 200 Lo-Dek piggyback flat cars equipped with roller bearings (see North American order above). 140 to be assigned to L&N; 60 to C&NW.

UNION PACIFIC. *General American.* 50 70-ton, 2,600-cu ft Airslide covered hoppers. To be equipped with roller bearings and used for loading bulk food commodities. For January 1961 delivery.

WESTERN OF ALABAMA. *Pullman-Standard.* 20 50-ft, 50-ton box. Ten equipped with special loading devices. For delivery this month.

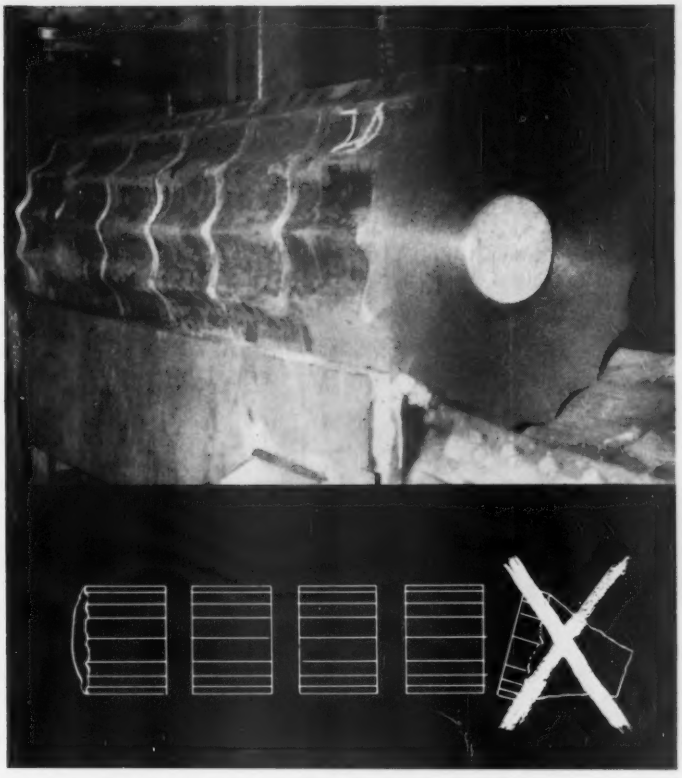
### Notes and Inquiries

*Burlington* has ordered 50 multi-level superstructures for converting flat cars to automobile carriers. The $500,000 order, divided between Dana Corp., ACF, and Whitehead & Kales, includes 5 bi-levels and 45 tri-levels.

*Port of New York Authority*, in announcing its willingness to buy the Hudson & Manhattan Railroad, says the capital cost of acquiring 300 new cars, rehabilitating and modernizing the railroad, including terminals and office buildings, would run between $40,000,000 and $50,000,000, in addition to the cost of purchasing the H&M. Estimated cost of the 300 cars would be about $30,000,000.

*Western Pacific* has purchased 40 superstructures for conversion of flat cars to multi-level automobile carriers. The 354,000 order includes 10 bi-level and 15 tri-level superstructures from Dana Corp., and 15 tri-level superstructures from ACF.

# How Armco "Discards" potential wheel defects



Impurities and shrinkage cavities are thrown away in the "top discard."

At Armco, special-analysis wheel steel is first poured into carefully proportioned corrugated ingot molds. Because of mold design, impurities and shrinkage cavities are located within the brick-lined hot tops. Then, after solidified ingots are cut into slices, *this top part is discarded*. Only clean steel goes into Armco Wheels.

## Forged and Rolled

After heating, ingot slices are forged and rolled to become durable Armco Wrought Steel Wheels. And here's evidence that this forging and rolling plus Armco's accent on quality pays off:

**In 27 years, Armco produced and shipped more than 1,250,000 one-wear wrought steel wheels. Of these, only six were reported defective!**

The new catalog, *Armco Wrought Steel Wheels*, gives details on these durable wheels and covers many practical points that can help you get more for your wheel dollar. Send the coupon for your copy.

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# Personal Mention

**Atlantic Coast Line.** — *Jacksonville, Fla.:* C. J. OLDENBUTTEL and H. J. STEIN, assistant general superintendents motive power and equipment, and F. D. SINEATH, assistant general superintendent motive power, appointed assistant chief mechanical officers.

**Chicago & North Western.**—*Chicago:* W. J. WEATHERALL appointed superintendent car department.

C. K. James

K. H. Carpenter

**Erie-Lackawanna.** — *Cleveland, Ohio:* C. K. JAMES named superintendent motive power, and K. H. CARPENTER, superintendent car department.

**New York Central.** — *Indianapolis, Ind.:* ROBERT J. PARSONS appointed master mechanic, succeeding F. A. DANAHY, transferred to Utica, N. Y. Mr. Parsons formerly master mechanic at Weehawken, N. J.

**Rock Island.**—*Chicago:* J. R. OSMAN, superintendent motive power, appointed general superintendent motive power, succeeding J. H. LLOYD, who has been appointed assistant vice-president.

**Southern Pacific.**—*San Francisco, Cal.:* F. E. RUSSELL appointed assistant general superintendent, Mechanical Department-Engineering, not general superintendent as mentioned in the September issue.

# Supply Trade Notes

DUFF-NORTON CO.—*Donald A. Anderson* appointed New York district sales manager, Jack and Coffing Hoist Divisions. Mr. Anderson previously district sales manager in upstate New York and New England.

■

ELECTRO-MOTIVE DIV., GENERAL MOTORS.—*Leroy R. Beck,* technical engineer, service department, appointed sales engineer.

■

AMERICAN BRAKE SHOE CO.—*Robert L. Carmichael* appointed New York District sales manager, Railroad Products Division. Formerly district sales manager of the division at Houston, Tex.

■

PULLMAN-STANDARD, A DIVISION OF PULLMAN INC.—*Charles J. Hurst* appointed sales representative. Formerly assistant manager P-S's sales and service engineering division.

■

HYATT BEARINGS DIV., GENERAL MOTORS.—*E. P. O'Neill* appointed assistant general sales manager, directing activities of railroad sales representatives throughout the country. Formerly manager Harrison Zone office. F. U. NAUGHTON, JR., manager of railroad sales, appointed to new position of manager, special railroad accounts.

■

BUCKEYE STEEL CASTINGS CO.—*Dr. James C. Settles* appointed chief mechanical engineer. *Harry A. Moeller* appointed engineering assistant to president, assigned to special duties.

■

OWATONNA TOOL CO. — *John Hann* and *Robert Wilkinson* appointed district sales managers, Oregon, Washington and Northern California territory. *William M. Myers* appointed district sales manager for State of Illinois, except Chicago.

■

WESTERN RAILWAY EQUIPMENT CO. — *William V. Davey* appointed sales manager.

■

AIR REDUCTION SALES CO. — *C. J. Langley* appointed assistant district manager at Philadelphia.

■

NATIONAL MALLEABLE & STEEL CASTINGS CO.—*Lucien Williams* appointed manager St. Louis, Mo., office, succeeding Howard Stark, retired. *Glenn G. Tenney* appointed manager, Philadelphia, Pa., office, succeeding *Russell J. Wittmer,* retired.

■

ADAMS & WESTLAKE CO.—*George O. Peckham* elected president, succeeding *S. C. Stafford,* now chairman of the board, and *Marion B. Shelly* elected vice-president.

## IMPORTANT CHANGES at MAGNUS METAL

R. G. Altizer

B. H. Sullivan, Jr.

Louis J. Gruber

*R. G. Altizer* and *B. H. Sullivan, Jr.,* have been appointed vice-presidents at Magnus Metal Corporation, a subsidiary of National Lead Company.

Also at Magnus Metal, *Louis J. Gruber* has been appointed assistant vice-president and *J. J. Hickey* has been appointed Chicago district sales manager.

Mr. Sullivan replaces *M. J. Turner,* who retired November 1, after 46 years of service. From 1946 to 1948 he was assistant coal traffic manager of the C&O. Prior to joining Magnus in 1952, he was president of the Orme Company. Messrs. Sullivan, Gruber, and Hickey are now located in Chicago.

Mr. Altizer has been with Magnus since June 1949 and has been assistant-to-president since January 1956. Formerly he was associated with Sperry Products, Inc. His office continues to be in New York City.

Mr. Gruber joined Magnus Metal in 1943 at Cincinnati where he was employed as test engineer. He was transferred to Chicago as sales representative in 1955.

Mr. Hickey was Magnus Metal sales representative in Houston from 1946 until 1957, when he was transferred to Chicago.

# Helps From Manufacturers

The following compilation of literature—including pamphlets and data sheets—is offered free to railroad men by manufacturers to the railroad industry. To receive the desired information write direct to the manufacturer.

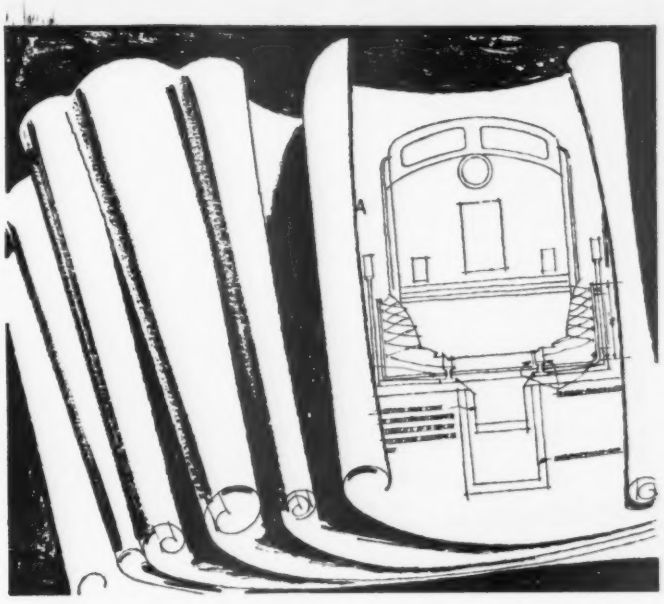
BELT SLINGS. 6-page folder, descriptive of new line of Safety-Weave synthetic web belt slings, contains information about nylon and Dacron slings; charts listing dimensions and capacities of synthetic slings in vertical, choker and basket applications, and available aluminum and steel fittings for nylon and Dacron slings of varying dimensions and capacities. (Write: *Jones & Laughlin Steel Corp.,* Dept. RLC, Muncy, Pa.)

CHEMICALS AND SERVICES. 4-page Bulletin No. 601 discusses chemicals and services designed specifically for railroad industry. Covers flange lubrication, water treatments for diesel cooling systems, fuel oil treatments, etc. (Write: *Nalco Chemical Co.,* Dept. RLC, 6216 West 66th Place, Chicago 38.)

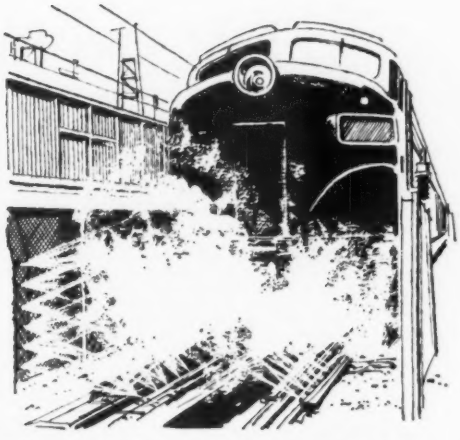
TRACTION MOTOR. Bulletin GEA-7046, "More Power per Axle," describes GE-752-E5 traction motor. Artist illustrations detail motor engineering and manufacturing advantages which make possible high horsepower four-axle diesel electric locomotives for high-speed service. (Write: *General Electric Co., Dept. RLC, Schenectady 5, N. Y.*)

*You're on the right track with*

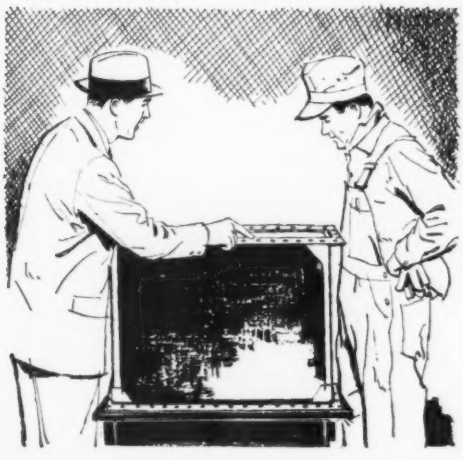
# WYANDOTTE SYSTEMWIDE SERVICE



## HELPFUL BLUEPRINTS



## BETTER CLEANING METHODS



## SYSTEMWIDE SERVICE

WYANDOTTE SYSTEMWIDE SERVICE is available from your Wyandotte railroad cleaning specialist—the man assigned permanently to your line. Many's the time he's been able to recommend a better cleaning method at lower cost.

Your Wyandotte cleaning specialist can furnish you with blueprints detailing cleaning system installations. These show you how to set up complete cleaning systems that will be both practical and economical. All are systems that can be completely shop built, using your existing scrap materials. Many railroads have profited by using these blueprints. Yours can, too!

There's a superior Wyandotte cleaner for every cleaning job on your railroad. There are Wyandotte products for vat and steam-gun cleaning, for getting rid of dirt inside diesel or steam locomotives, and for cleaning locomotive exteriors (including wheels, trucks, and gear case covers) manually, or automatically.

Other products include cleaners for passenger car interiors and exteriors; and paint strippers. Plus: more specialized cleaners for other important railroad maintenance jobs—from descaling diesel cooling systems to deodorizing freight car interiors.

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*Specialists in railroad cleaning products*

# COBRA® SHOE

## Significant 3 year

**Total No. of Units in operation equipped with Cobra Shoes** **7060** **UP 470%**

**No. of Companies with one or more units using Cobra Shoes** **155** **UP 370%**

**No. of Passenger Cars, including commuter and subway, using Cobra Shoes** **1397** **UP 100%**

**No. of Locomotives in operation equipped with Cobra Shoes** **1033** **UP 2000%**

**No. of Freight Cars (all types) in operation using Cobra Shoes** **4630** **UP 400%**

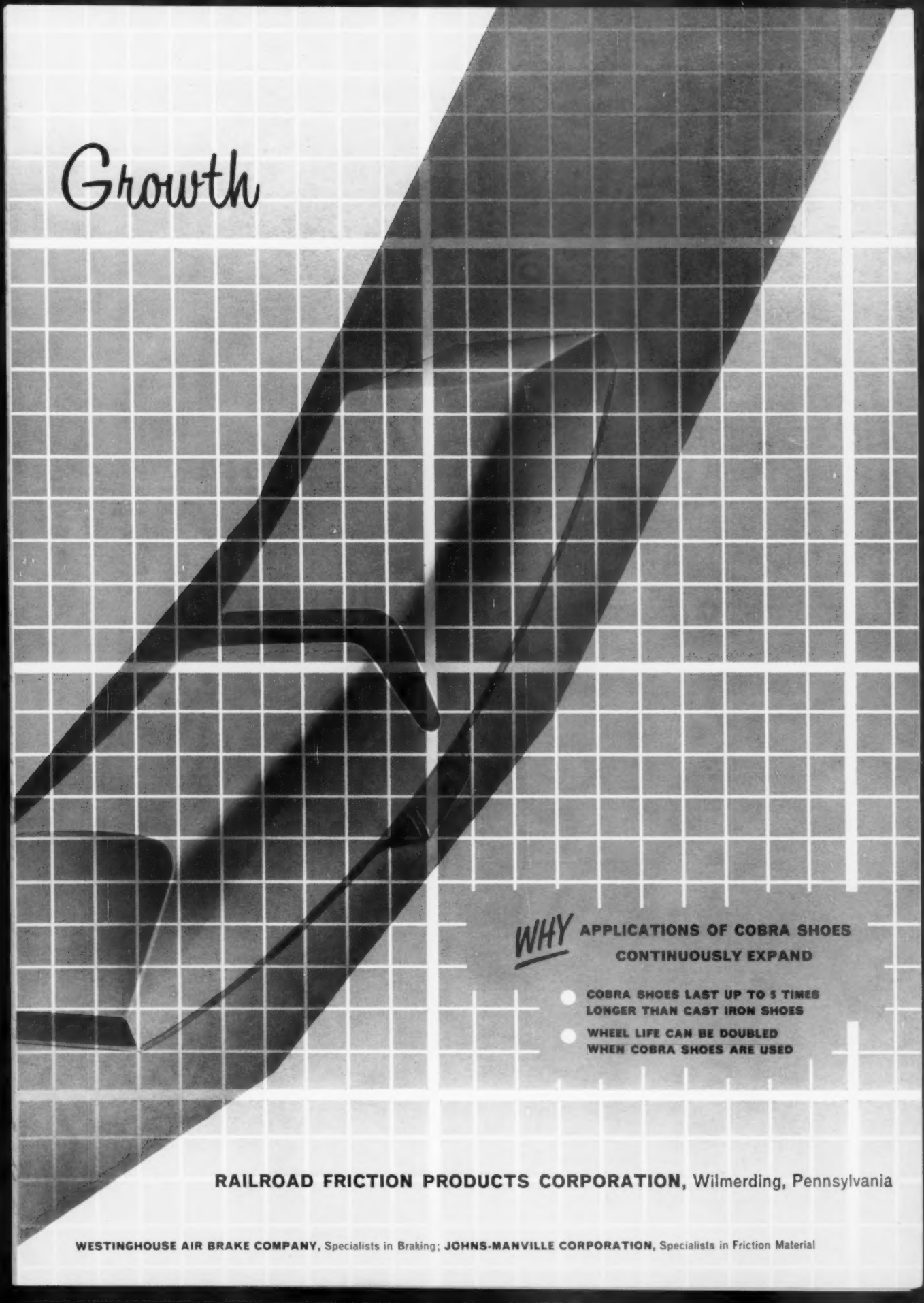
*In the high utilization Piggyback Service, Cobra Shoes are becoming the Brake Shoe of choice*

**No. of Piggybacks in operation equipped with Cobra Shoes** **1836**

(None Three Years Ago)

*Comparisons based on installations existing in fourth quarter of 1957 and 1960.*

**THE COBRA SHOE . . .** a product of the combined research facilities of


Growth
WHY APPLICATIONS OF COBRA SHOES CONTINUOUSLY EXPAND
COBRA SHOES LAST UP TO 5 TIMES LONGER THAN CAST IRON SHOES
WHEEL LIFE CAN BE DOUBLED WHEN COBRA SHOES ARE USED
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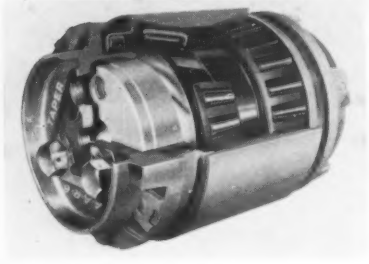
# LOCOMOTIVES AND CARS WHAT'S NEW IN EQUIPMENT

## Distributing Valve

The 6-N distributing valve operating portion has been designed as a direct replacement of the present 6-K operating portion of the No. 6-KR distributing valve. It permits upgrading of existing 14-EL, 6-DS, 6-BL, and 6-SL type locomotive brake equipments. In the new portion, brass rings have been replaced with sensitive rubber diaphragams; an "O" ring spool valve and rubber check valve are substituted for the application and exhaust slide valves. Maintenance costs are thus said to be greatly reduced; and stuck brakes and other limitations of the 6-K operating portion eliminated where as many as five or six diesel units are operated together in a multiple-unit locomotive. The new 6-N portions are interchangeable with older No. 6 versions and permit addition of a dynamic interlock magnet valve without the need for any external piping. *New York Air Brake Co., Dept. RLC, 230 Park ave., New York 17.*

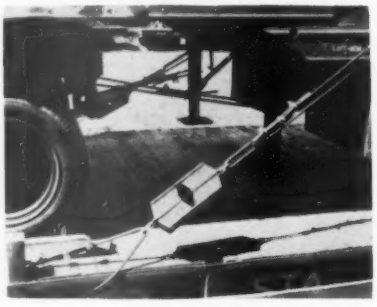


## Taper Freight Bearing

The Hyatt taper freight bearing, approved by the AAR for use in interchange freight cars, is designed for installation both in pedestal and integral box freight-car truck side frames. It employs the same adapters and can be installed interchangeably with other freight-car roller bearings. It is dimensioned for a press fit on standard AAR roller-bearing axles and is currently available for 5½ x 10, 6 x 11, and 6½ x 12 journal sizes. The dust guard overhangs and shrouds the seal. A stainless-steel garter spring insures uniform contact of seal lips. The steel outer shell for the sealing element is pressed into outer race bore, and a hardened and ground steel ring provides a long life operating surface on the axle.

The bearing, as lubricated with an AAR approved grease, requires no additional lubricant until the periods prescribed by AAR Rule 66-A are reached. A specially designed fixture automatically forces a predetermined amount of grease into the bearing and distributes it evenly throughout the operating parts. As an overcheck after seals have been pressed into each end, the bearing is weighed to make sure it has received the specified amount of grease.

No special tools are needed for application or removal of the bearings. On high-speed runs in piggyback service and on covered hopper cars, the bearings are said to have been averaging 10,000 trouble-free miles a month. Box cars and gondolas equipped with the taper bearing are expected to go into service soon. *Hyatt Bearings Div., General Motors Corp., Dept. RLC, Harrison, N. J.*

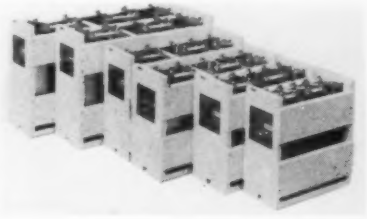


## Elastic Tie-Downs

The Tylastic Tie-down System is said to reduce impact forces to safe levels and prevent damage by allowing flat-car lading to "roll with the punch." Through the use of elastomeric springs, it can deflect up to 20 in. under a 30,000-lb load (minimum breaking strength. At speeds of 8 to 10 mph, the system will absorb up to 90% of the longitudinal shock force on the flat-car floor and prevent it from reaching the lading. *Lord Manufacturing Co., Dept. RLC, Erie, Pa.*

## Spot Car Repair System

The spot car repair system for low demand, light repair tracks and semi-heavy repair tracks in classification yards utilizes one car puller with a "rabbit" to index the cut of coupled bad-order cars into the shop and to move single repaired cars to the outbound storage track. Where production warrants, hydraulic jacks are built into the floor and a car stopper (retarder) is included in the system. The system can be adapted to cleaning tracks, up-grading tracks, car loading and unloading operations, and other similar applications. The standard spot car repair system for high-demand, light repair tracks consists of an inbound and an outbound car puller, jacks, and a car stopper on each track. *Railway Maintenance Corp., Dept. RLC, Box 1888, Pittsburgh 30, Pa.*



## Nickel-Cadmium Batteries

Nickel-cadium batteries added to the line of Exide industrial storage batteries have nickel and cadmium oxide active materials contained in perforated steel pockets of the positive and negative plates. They are offered as a power source for starting engines to generate emergency power; for emergency lighting systems, and for other specialized applications. The batteries are available in 22 electrical sizes, with 8-hr capacity ratings ranging from 10 to 450 amp hr, and in other special types and sizes. *Exide Industrial Div., Electric Storage Battery Co., Dept. RLC, 12 South 12th st., Philadelphia 7, Pa.*

## Mobile Welder

Larger wheels in the rear with Ground Gripper tires, with implement type tires in the front, and the increased ground clearance at both axles have improved the mobility of the new Weldmobile over that of previous models. The unit travels directly to the job and is ready to weld without waiting for power lines to be hooked up. With a towing capacity rated at 2,000 lb. drawbar pull, it can tow other equipment or material to jobs at widely separated points.

The 400-amp model is powered by a Chrysler 6-cylinder industrial engine, and the 600-amp model is powered by a Chrysler V8-cylinder industrial engine. In addition to welding power, the Weldmobile can supply up to 1 kw (110 volts d-c) auxiliary power for operating lights and electric motor powered equipment.

At the rear of the unit are two wells and brackets for acetylene and oxygen tanks. Welding, traveling and power controls are on a special dashboard in front of the drivers seat. *Hobart Brothers Co., Dept. RLC, Troy Ohio.*

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## Gageless Pressure Regulators

A line of two-stage gas-pressure regulators without glass-covered gages is available both for oxygen and acetylene cylinders used in welding, heating, or cutting operations. The regulators are especially useful where rough usage is encountered.

Delivery pressure is set with a micrometer type indicator. Two ranges of regulation are attained by means of a low-high marking on the adjusting knob, and three lines on the spring case. The position of the knob in relation to the lines on the spring case determines whether high or low readings apply. A cylinder pressure indicator, clearly visible at the top of the regulator, is protected by a forged brass housing.

The oxygen regulator has a maximum working pressure of 100 psi; the two acetylene regulators, a maximum of 15 psi. Conversion kits for changing conventionally gaged regulators in the same class to gageless regulators are also available. *Air Reduction Sales Co., a division of Air Reduction Co., Dept. RLC, 150 East 42nd st., New York 17.*

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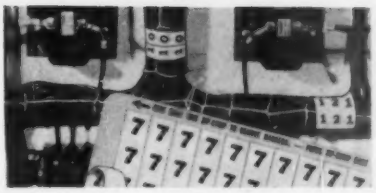
## Cable Markers

Self-sticking vinyl-plastic cable markers, ½ in. x 3½ in., are used to identify cables, extra large wires, and conduits up to 1 in. in diameter; also to mark and band wires in wiring harnesses and multi-wire circuits.



Because of the elasticity of the insulating vinyl material, the markers can be "stretched" around groups of wire, providing a tighter and more compact installation. Each marker is printed continuously with a bold, black-on-white numeral or letter. *Dept. 594, W. H. Brady Co., Dept. RLC, 727 West Glendale ave., Milwaukee 9, Wis.*

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## Mobile Heaters

The Perfection MH series heaters are for use on trucks, buses, trains, and other mobile equipment. They operate on such fuels as gasoline, kerosene, fuel oil, diesel oil, and crankcase drainings, providing heat for passengers and operators, for window defrosting and cargo, or for quick engine warm-up in coldest weather. Fuel shut-off is fully automatic if the heater fails to ignite, and the combustion burner is totally enclosed. There are no nozzles to clog. Adjustable clamps permit mounting the heater in any position. Model MH-15, weighing only 16 lb, generates 15,000 Btu per hr and consumes less than ¼ gal of fuel per hr. Models MH-30 and MH-60 generate 30,000 and 60,000 Btu per hr, respectively. All models offer operating voltages of 6, 12, or 24 volts d-c, wth converters available for 115-volt a-c operation. *Perfection Div., Hupp Corp., Dept. RLC, 1135 Ivanhoe Road, Cleveland 10, Ohio.*

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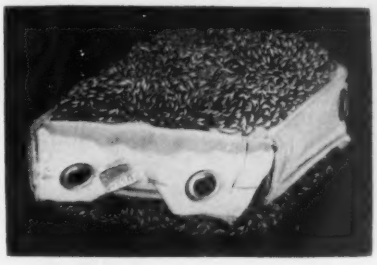

## Journal Lubricator

The AAR test approved Crown lubricator contains a core of acrylonitrile rubber, a material said to be highly resistant to deterioration in the presence of petroleum products and to maintain its resiliency over a wide range of temperatures. The construction of the core is such that a direct flow of oil to the journal is provided. The casing of the lubricator is made of a heavy-duty, high-wicking duck material to which loops have been secured by the chenille process. In addition, the casing has been strengthened at critical wear points with abrasion-resistant nylon herringbone webbing and an extra thickness of high-wicking canvas. According to the manufacturer, the lubricator does not glaze because of its dense loop pile. It is also said to be reclaimable. *Journal Box Servicing Corp., Dept. RLC, 332 South Michigan ave., Chicago 4.*

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## Corrosion Inhibitor

Spray application RP 252, a liquid corrosion inhibitor, is said to be highly effective for protecting metals from rust and corrosion during open shipment and outdoor storage. Other benefits are said to be ease of application and removal, absence of residue that previously interferred with welding and painting, and less need for oil-absorbent floor compound in the spray area.

Thixotropic in nature, the liquid is a virtually colorless, odorless material that spray coats and gels on contact with metal. When metal is ready for further fabrication, removal of the inhibitor is said to be easily accomplished with a mild alkaline wash. *Nalco Chemical Co., Dept. RLC, 6216 West 66th Place, Chicago 38.*

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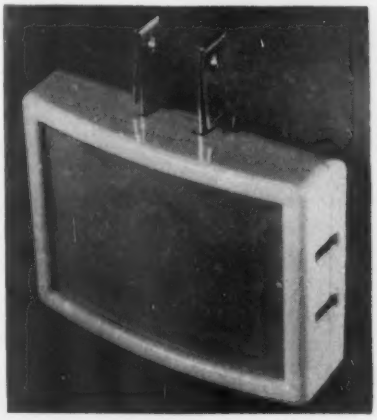

## Light Source

Electroluminescent lamps, said to be five times brighter than others now available, range in size from 1 sq in. to 164 sq in. (11¾ in. x 14 in.) They can be supplied in green, blue, yellow, and white, encapsulated in flexible plastic panels only .030 in. thick. Initial brightness, operating on 60-cycle, 120-volt current, ranges from 4.5 footlamberts (units of light) for green; 1.5 for yellow and white, to approximately 1 footlambert for blue. *Miniature Lamp Dept.* (RGO6), *General Electric Co., Dept. RLC, Nela Park, Cleveland 12, Ohio.*

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## Reefer Decking

Decking being used in refrigerator cars under construction at the Los Angeles, Calif., yard of the Pacific Fruit Express is of overlaid lumber. It is regular 2-in. Douglas fir, edged glued into 4-ft x 9-ft panels after drying to 6 per cent moisture content.

*(Continued on page 52)*

# EDITORIALS

## Piggyback Interchange

Piggyback interchange rules applying to trailers and containers have been submitted to Mechanical Division members for letter ballot action. If approved, they are to go into effect next January 1. Appropriate committees of the Mechanical and Operating-Transportation Divisions of the AAR are still working on loading rules for open-top and closed trailers. When these are completed and approved, trailer and container transportation will be subject to the same sort of regulation which now applies to freight cars.

Piggybacking has grown so rapidly that railroads are today confronted with a sizeable operation which has, to date, been operated without much formalized regulation. Equipment designers have brought the piggyback car and its attachments to a state which, apparently, is quite satisfactory for trailer service. It would appear that the general form for the piggybacking of highway trailers is now well established.

This same thing cannot be said about containers. Here, not only the rail and highway carriers are involved, but also marine operators and the military. While containers in lengths of 10 ft and multiples may eventually become standard, there are at present many sizes. There is also a variety of handling and cushioning arrangements. It will apparently be some time before rail transportation for containers can be considered to be as stabilized as is now the case with TOFC. For the present, primary emphasis in interchange regulations will, of necessity, remain on trailers.

## Mergers Change Thinking

The air is full of mergers. Three have been completed; about ten more are at least in the discussion stage, and it is a safe bet that others are being considered. The mergers recently completed and those that will surely be approved and consummated in the future are changing, and will continue to alter, mechanical department planning.

What do mergers mean to the mechanical departments? Most of all, they mean opportunities exist, or will exist, for the centralization of repair and maintenance work. One shop may take the place of two, with a resulting jump in the volume of work at the location selected.

This consolidation of work for two or more railroads, formerly independent, at one repair or maintenance point may permit the introduction of production tools and equipment. For production shops are economically sound only when the work load is large enough to pay for the greater investment in the tools and equipment.

These mergers mean that many mechanical department officers may be faced with a complete change of thinking. What was formerly impracticable could suddenly become very feasible indeed. This changing railroad picture gives mechanical departments opportunities to do a real job in setting up production shops.

## Future Fuels

Several means of direct conversion of chemical energy or heat into electrical energy are now receiving the attention of engineers and scientists. The Battelle Memorial Institute has announced a long-term research program which is underwritten by 25 companies to advance fuel-cell technology.

The fuel cell is essentially a battery which is kept constantly charged by introducing and combining fuel elements between the battery plates. It was conceived nearly 100 years ago, but only recently have serious attempts been made to make it a practicable device. In its present form it is costly and expensive to operate. It is highly efficient, but its efficiency falls off with increasing load values. For high outputs, the need for high-temperature operation is indicated.

Thermoelectric conversion of heat to electric power consists of applying heat to one side of a coupling of dissimilar metals and taking it away on the other. It involves great technical difficulties and will apparently require temperatures difficult to obtain on a locomotive.

Magnetohydrodynamic conversion is a fancy name used to indicate moving conducting gases at high temperature through a magnetic field. It can only utilize the upper range of the temperatures required and must have, in addition, some other kind of heat exchanger and power plant to utilize the energy in the exhaust gas. If developed, it would apparently have to be used in the field of stationary power plants.

Atomic energy might be used as a source of high temperatures, but the hazards involved in using it on a locomotive apparently preclude its application.

Fuel oil burned in internal combustion engines now supplies nearly all the motive power in this country. Its price will rise as supplies diminish, but the present sources can apparently be maintained for some time and may possibly be extended by recourse to oil shale, hydrogenation of coal and even distillation of vegetable products.

In this there appears one significant fact. All forms of direct conversion produce direct current electric power. The bulk of our present locomotives are diesel d-c electrics. The newest form of electrification now used in several foreign countries employs d-c traction motors.

The railroads would, of course, like to see hydraulic drive give electric drive some first-class competition, but the point in this discussion is that, if it is to be electric, the locomotives will use d-c motors. The same motors, with little or no change, could be used with any one of the possible kinds of power supply.

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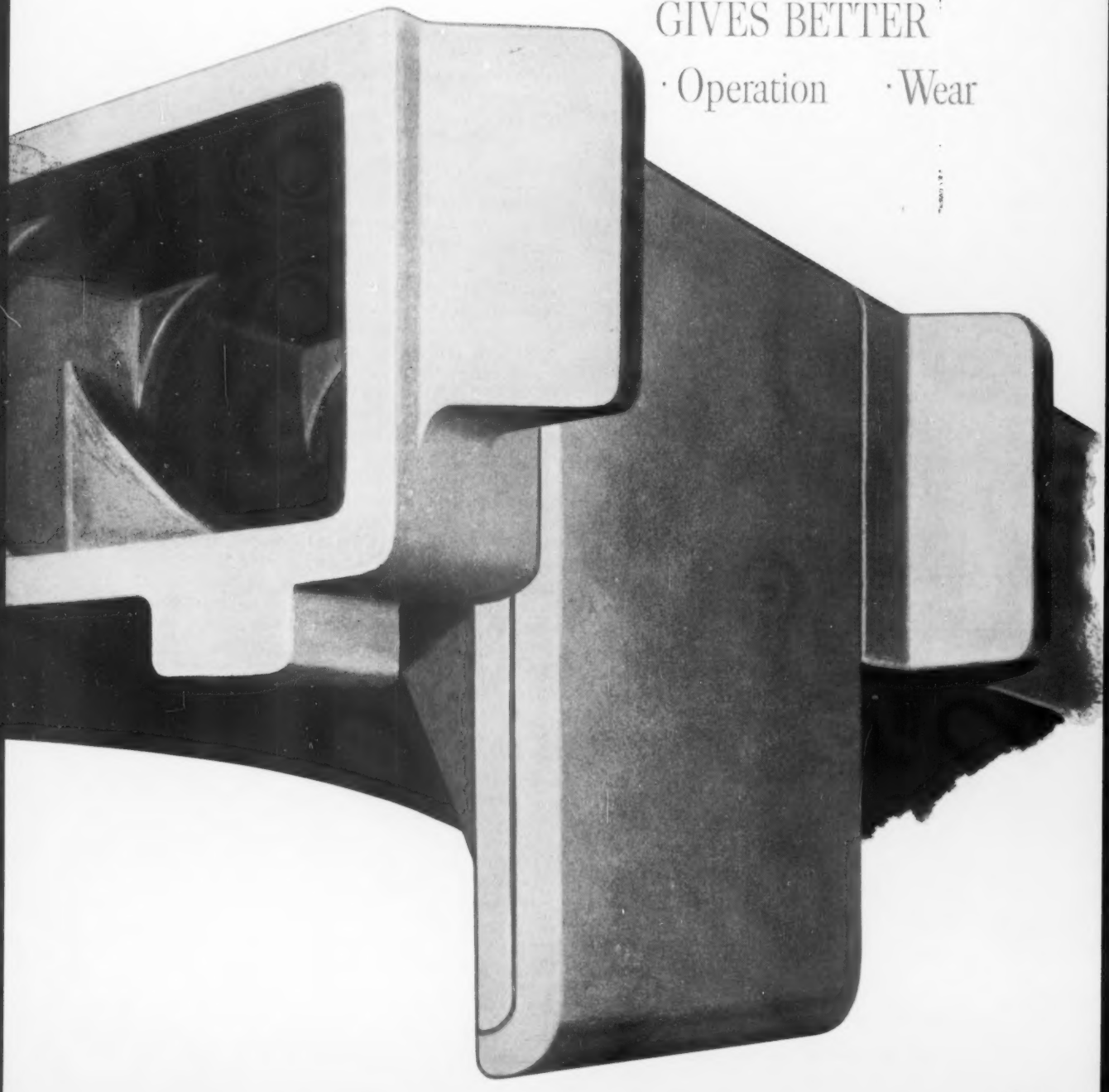

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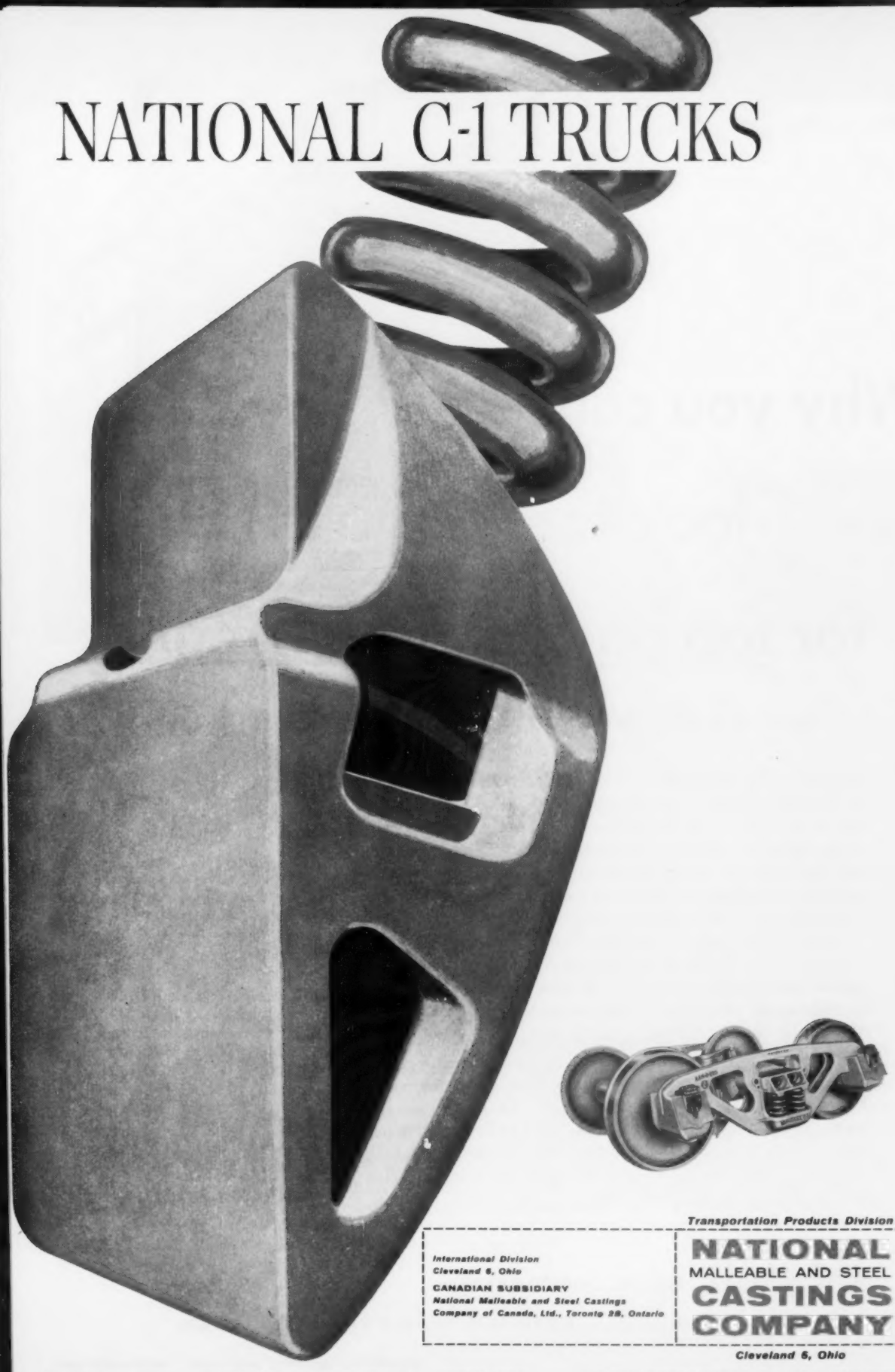
# NATIONAL C-1 TRUCKS





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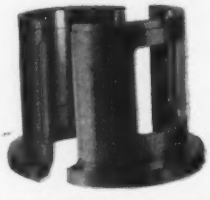
Magnus bearing products have been serving America's railroads for the past century. And in full cooperation with the railroads, Magnus has pioneered many significant advances in bearing metallurgy and design. A recent example: the Magnus R-S Journal Stops. By taking the "slop" out of the journal box, R-S Journal Stops eliminate excessive bearing displacement under the severe shocks of braking and switching impacts—increasing bearing life 200% and cutting costs all along the line. Magnus lubricators provide another link in the chain of improved bearing performance. And in diesel and electric locomotives and MU cars, modern Magnus traction motor support bearings assure trouble-free mileage between motor overhauls.

With this background of experience, Magnus is continually investigating new designs of journal box components for still greater efficiency and economy in railroad service. Whatever the future may hold, of this you can be sure. Tomorrow's rolling stock will ride on Magnus bearings—bearings that are right for railroads, in performance and in cost. For further information on Magnus bearing products, write to Magnus Metal Corporation, 111 Broadway, New York 6, or 80 E. Jackson Blvd., Chicago 4, Ill.


Magnus Solid Journal Bearings

Magnus R-S Journal Stops



Magnus Traction-Motor Support Bearings

**MAGNUS METAL CORPORATION**

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Canadian National tests demonstrated the practicability of controlling a road freight operation from a remote location.

# Automation of Motive Power

## *Technological developments have made practical the introduction of automatic train operation*

Motive power automation might soon confront mechanical officers with a challenge comparable to that presented by the introduction of the diesel locomotive. Motive power design, maintenance, and operation could all be involved. Last month the rapid progress made by automation was discussed and demonstrated at several meetings and conferences. Road freight, switching, and rapid transit operations have all been successfully automated. The consensus is that automatic railroading may be much closer than most railroaders thought possible only a few months ago.

Many of the basic tools—train control, coded track circuits, cab signals, and speed control—have been in use for years. Complete motive power automation has been under development for the past five years. "ATO"—automatic train operation—may some day become a term as familiar to railroaders as "CTC" is today.

"We're simply applying today's knowledge to today's railroading," C. L. Patterson, chairman of the New York City Transit Authority explained during the demonstration of the first NYCTA automated, multiple-unit, transit train on October 13. This equipment is expected to be in revenue service without an operator within six months. General Electric demonstrated a radio-controlled industrial switching locomotive at the annual meeting of the American Short Line Railroad Association in Green Bay, Wis., early in October. Such remote control, according to GE, would make it possible for one man to switch or make up trains.

Automated locomotives, or self-propelled cars have already been tested on the New Haven; Quebec, North Shore & Labrador; and the Canadian National. Several industrial railroads already are undertaking the automation of specific operations.

Railroad automation is a "natural" because of the precisely defined rights-of-way, a newsletter of the American Transit Association reported recently. "These rights-of-way are exclusive lanes for train traffic only and are under the sole control of the operating agency. They follow a geographic pattern where speed limits can be established, switching locations defined, and traffic patterns scheduled . . . Complete automation is not only feasible, but entirely practicable with today's technology. With the exclusive control of the private property over which the trains operate, rapid transit and the railroads have a tremendous economic advantage over all other forms of transportation for which automation is being considered."

Automation of motive power can be achieved in three ways that contrast with "internal manual control" which characterizes conventional locomotive operation. Internal manual control

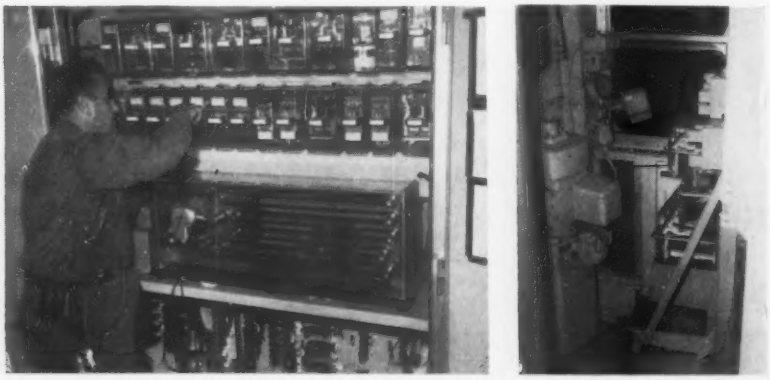
means that each controlling motive-power unit carries an operator who observes wayside and train conditions so that he may manually adjust power and braking to produce the speed and schedule desired. To take the place of this internal manual control, there can be external manual control, internal automatic control, or external automatic control.

*External manual control.* The operator observes the location and functions of the motive-power unit from a remote location and manipulates the remote controls on the basis of his observations. A New Haven m-u train tested in 1955 (RL&C, January 1956, p 10), the General Electric radio-controlled switcher, a similar industrial switcher built by Plymouth Locomotive Works, a gravel-handling operation on the QNS&L, and an automated yard locomotive on the French National Railways are all examples of external manual control. The system is most suitable for yard and industrial railroad operations.

Remote control equipment, which makes, possible remote control of a slave locomotive, has been developed and has undergone tests on a western railroad. One part of this remote equipment is installed on the lead locomotive of a train and the second portion is installed on a helper locomotive that may be at any other location in the train. The controls on the second locomotive follow in a slave fashion the the controls of the first locomotive, receiving signals by radio from the lead unit. The remote controls give smoother performance than can be obtained by manual operation of the second locomotive, because there is much better coordination between the controls of the two locomotives when it is performed automatically. What is achieved is multiple-unit operation without control jumpers.

*Internal automatic control.* The controlling motive-power unit carries a computer, programming equipment, and devices for sensing train and wayside conditions and location. Tests were conducted with such equipment on the Kubishev-Besimianka Railroad in Russia. It has been reported that the equipment responds "faultlessly to signaling on block control territory, selects the most advantageous speed and braking, and takes into account the profile and alignment of the roadbed and load of train, continuously performing the required computations." Following his recent trip to Russia, C. D. Buford, AAR vice-president, reported, "We were told the train is 'temporarily under repair.' " Any internal automatic control system requires that practically all motive-power units carry complete sets of computing, programming, and sensing equipment.

*External automatic control.* In this system, the computer and programming equipment are located at a single wayside location. Commands from this equipment are continuously and automatically transmitted to the locomotive. The New York Transit subway train, and an experimental road freight operation on the Canadian National over the past few months, all involved techniques which are part of external automatic control. It is quite probable that this system could ultimately be the basis for automation of main-line railroad operations.



Automatic dispatcher at wayside (left) contains programming equipment for automatic subway train. Relays and controls for remote operation have been located in car cab (right).

Automated operation with this equipment is expected to begin in about six months. Train will then traverse 2,700-ft route between New York's Times Square and Grand Central Station.

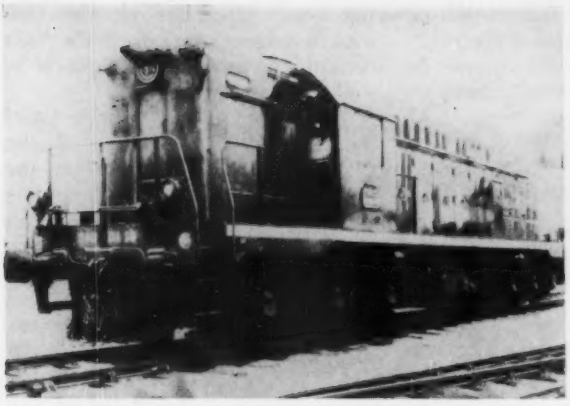
## Canadian National Study

Last year the Canadian National research department prepared a report which came to the following conclusions about automation of train operations:

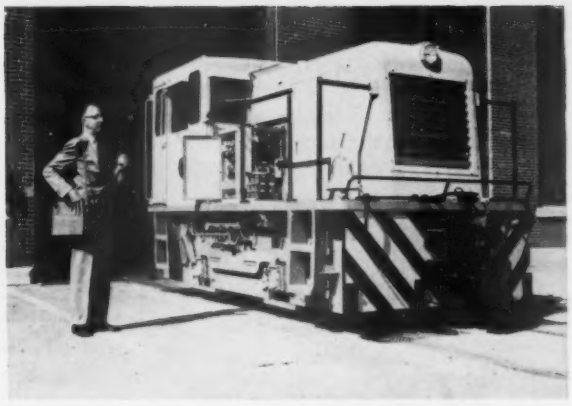
- Continuous, not intermittent, control would be required;
- Radio or line-side induction would not provide the degree of protection required;
- Track circuits providing continuous train control could be integrated with the supervisory control of CTC;
- The system should be able to provide "situation reports" from the automated train;
- Directing of trains from a central brain would be desirable, eliminating duplication of equipment on many locomotives;
- Locomotives need be capable only of interpreting control signals received and of checking train and locomotive conditions.

The CNR pointed out that, with proper signaling, conventional trains could be operated over the same routes as automated trains and could be interspersed with them.

The French National Railroads came to similar conclusions in a study of remote train control. The basic re-



Remote operation with this Baldwin yard diesel has been successful. French National Railroads have now equipped four additional units.



Industrial switcher, built by General Electric, can be controlled with 15-lb radio transmitter by using ten push-buttons and "deadman" switch.

quirements were "trainsmission of information and orders from a centrally located point to a train in motion, and control of the locomotive speed at a predetermined rate."

Solution to the first problem came in 1955 when a d-c electric locomotive hauling five cars was started, accelerated, slowed and stopped by signals from a wayside radio station. The second problem was solved during more recent experiments with a switching locomotive. Speed was controlled from the tower over a speed range from 0 to 24 mph. Switching operations were selected for experiment to avoid difficulties arising from the slowing of long trains with air brakes. This French system is an example of external manual control.

### French Locomotive

Initial work was with a six-axle, 600-hp Baldwin switcher. After two years of service at Acheres Yard, near Paris, this unit is still in operation. Four additional remote controlled switchers have since been placed in service.

Automation of a switching locomotive required the development of several new controls. The locomotive is controlled by radio, usually from the principal yard tower. Initially, it was anticipated that there would be three operating speeds: 25 mph, 9 mph, and the cutting speed of 2.4 mph. Later it was decided to achieve continuous control over the entire speed range. The locomotive must be reversed remotely.

It was also necessary to produce a device which would give a satisfactory coupling speed. The locomotive escapes tower control as it approaches a freight car and slows automatically to an impact speed of 1.2 mph. Following coupling, the unit comes back under tower control.

If required, remote control should be possible from other towers and from any part of the yard with portable transmitters. The locomotive should be immediately available for normal manual control if remote control fails or if the locomotive is to be used outside yard limits.

At present, control of operating and approach speeds, control of reversing, and instantaneous change-over from automatic to manual operation have been perfected. Of interest to mechanical officers is the method evolved by the French National for speed and braking control. The Baldwin switcher is equipped with an air throttle (0 to 57 psi pressure range) and with automatic and independent air brakes. This similarity between acceleration and braking controls was the basis for the French National speed control mechanism. This servo-mechanism has been designed to replace the manual controls without making any modification in the existing equipment. Either automatic or manual control is instantly made available by turning a switch.

The servo-mechanism consists of two automatic reducing valves, one for operating the engine governor and the other for controlling the independent brake valve. These valves are operated by pilot pressure ranging from 0 to 57 psi, with the higher pressures activating the diesel engine governor and the lower values activating the brake valve. This pilot pressure is modulated by currents ranging from 0 to 150 milliamps passing through the electro magnet of the pilot reducing valve. The current is proportional to a variable voltage which is controlled by radio.

A transmitter with a carrier of 160 Mc incorporates a device which modulates the carrier at 1,000 cps. This modulation is interrupted with a frequency of 15 cps to provide a signal which can be used to vary voltage.

Because radio transmission is not interrupted, other modulation bands are used for other transmissions. The remote control of forward and reverse is achieved by utilizing the same carrier used for speed control. Three low frequency modulations are used: 110 cps for forward motion; 125 cps for neutral, and 140 cps for reverse.

Reversing signals can be given while the locomotive is in motion. "Memory relays" coupled with appropriate safety devices perform the operations in correct sequence. After discarding radar and ultrasonic techniques as methods for controlling coupling speed, the French National Railroads turned to an oscillating circuit in the rails between the locomotive and the freight car it is approaching. The resonant frequency is related to distance so that at the proper point the locomotive is cut off from tower control and its speed is dropped to an approach speed of 1.2 mph.

### New York Subway

First application of automated equipment to a rapid transit train is being tested by the New York City Transit Authority in cooperation with General Railway Signal, Union Switch & Signal, and Westinghouse Air Brake. These tests, which have been in progress since January, are being made on the Sea Beach Line of the BMT Division in Brooklyn.

This installation permits a completely automatic operation in which the train starts and proceeds to the

next station, stops, doors open, and doors close. The train then returns to its starting point. A programmed movement of the train is controlled from the wayside by electrical impulses sent through the running rails to receivers mounted on the front trucks ahead of the wheels and close to the rails. The pulses are converted to relay operation which, in turn, controls motoring, brakes and doors. Three code rates are used in this application to provide the controls: 75, 180 and 270 pulses per min. Absence of code also activates controls.

When a 270 code is applied, the train accelerates to approximately 29 mph and maintains this speed. At an insulated joint approaching the station, the 180 code is applied to initiate the first application of dynamic braking, reducing speed to 5½ mph.

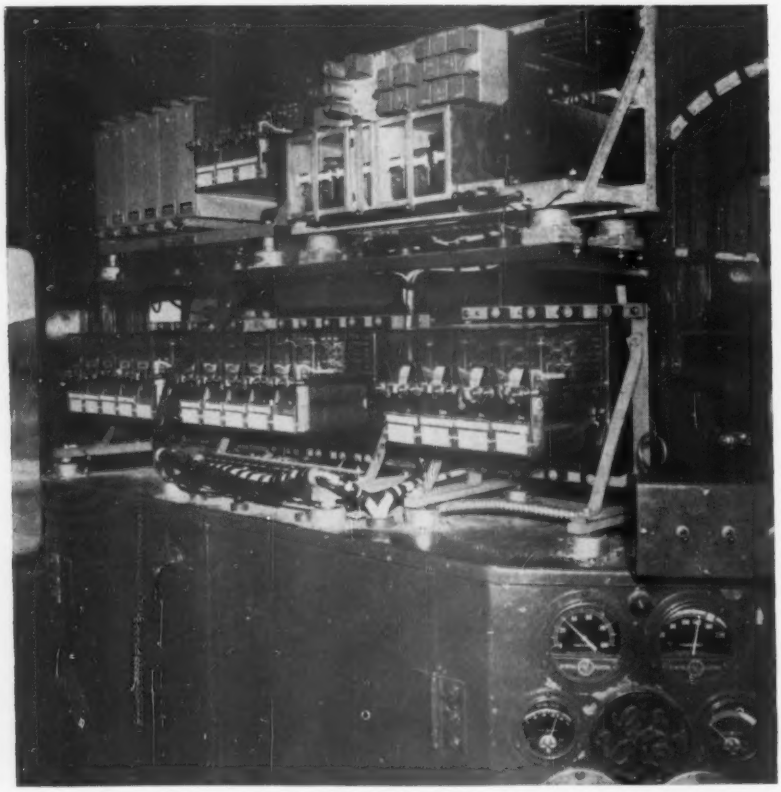
As the train approaches the final stopping point, another insulated rail joint is passed where the 180 code is removed and no code is received, so the train is stopped by a service brake application within 5 ft, plus or minus, of the desired platform location.

After the train is stopped, a 75 code is applied which unlocks and then opens the doors. The train will remain standing in the station with the doors open and the brakes applied.

After a predetermined interval, the 75 code is removed which closes the doors and releases the brakes. All safety features used in this system have been designed to "fail-safe" by removing power and applying emergency braking in the event of a failure.

To simplify the problem of brake control on the automated subway train, the cars have been equipped with Cobra composition shoes. The relatively uniform braking characteristics of these shoes at varying speeds make it unnecessary to graduate the brake application. This means that only one code can initiate the service brake application which then remains unchanged as the train decelerates to a complete stop.

In 1958 a remote-controlled, 600-hp diesel locomotive employing inductive carrier control was developed, tested, and placed in service on the Quebec, North Shore & Labrador. Its work there is repetitious — hauling three loads of gravel about one mile to a dumper and then returning the same cars empty to the shovel. This system includes controls for the pneumatic dumping of the cars. It is inductive from a single line-side wire. One man in a tower overlooking the plant controls the processing equipment as well as the train.



Cab control equipment for remote operation has been installed above the regular traction controls on this industrial switcher used on gravel-handling operation in Quebec.

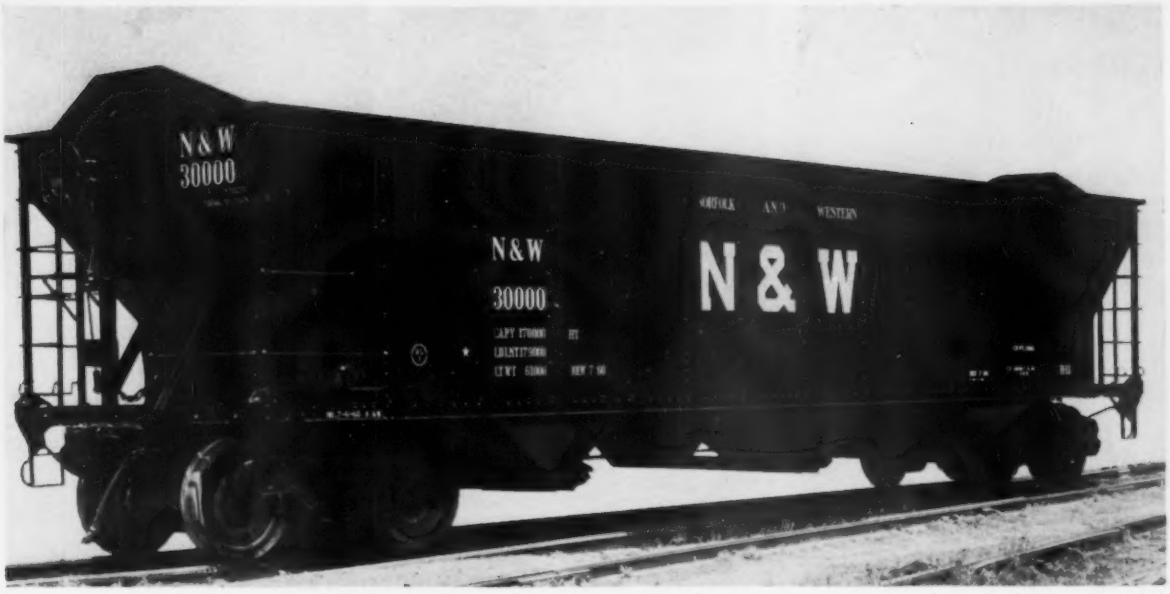
Automation of the 40-mile Carol Lake Railway, branching off the QNS&L in northern Quebec, was the topic of a conference organized by the Carol Lake owner, Hanna Mining Co., in July 1959. Ore trains of 125 cars, 11,000 tons, are to be powered by four 1,750-hp diesel locomotives. Interested railroads, General Motors Diesel, and General Railway Signal met to produce specifications covering automatic train operation for this ore carrier which is to branch off the 357-mile QNS&L at milepost 244.

### Main Line Experiment

The Air Brake Division of Westinghouse Air Brake was invited to participate in the project. Each of the three suppliers assumed responsibility for that part of the ATO system peculiar to its regular activities. Each built a control "package." The CNR cooperated by making available a 1,750-hp road switcher, which was modified with the special controls. It was first tested in the shop and on yard tracks at the GMD works in London, Ont. During these tests, no wayside equipment was installed. Instead, the codes were generated by equipment carried on the locomotive and applied inductively to the locomotive receivers of the control-sensing equipment.

The CNR then made available 10 miles of track near London and provided a train, crew, and necessary running rights. Tests of automatic operation of a diesel-powered freight train began early last summer. An extensive test program simulated all conceivable operating conditions. The line where tests were conducted contained enough grade to provide reasonable grade operating conditions, both ascending and descending. The test train was comprised of 35 cars, about 2,000 tons, approximately normal tonnage rating for this locomotive.

Tests were concluded by making runs on a section of line having a 9-mile 1% descending grade. For these runs, the ATO locomotive was coupled in multiple with a standard road switcher. Only the regular control jumpers were used between these two units. For one run, a 76-car train of about 6,600 tons was handled automatically down the grade, using both air and dynamic braking.




This H-11 car, designed for movement of 85 tons of coal, has a light weight of 61,000 lb. Riveting is used on sides, but most of the car is welded.

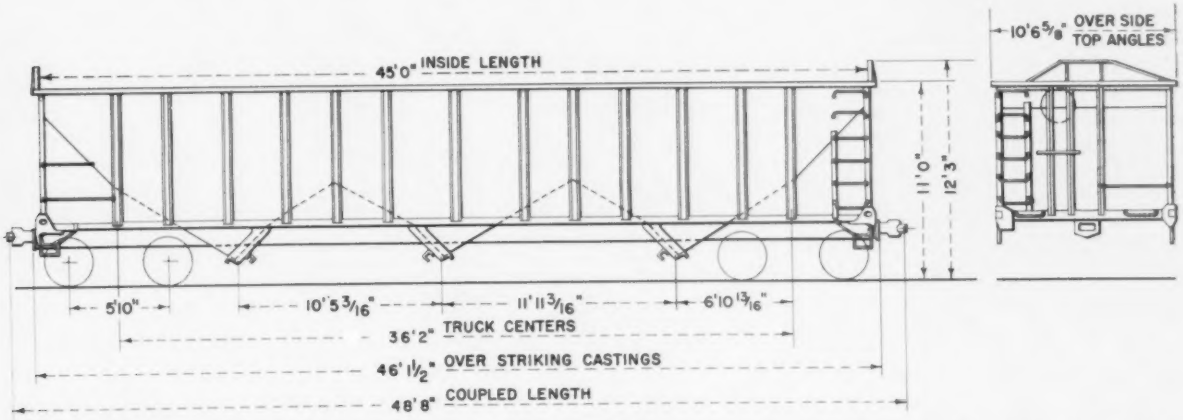
# N&W Is Building 85-Ton Hoppers

## *High-capacity cars being added to extensive N&W open-top car fleet at eight-per-day rate*

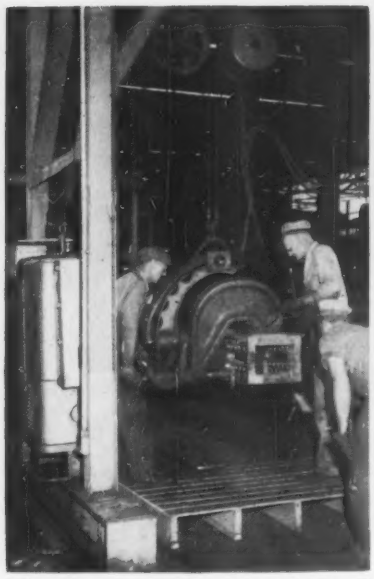
Eighty-five-ton hoppers are rolling off the Norfolk & Western's production line at its Roanoke, Va., shop at an eight-cars-per-day rate. These cars, the first 85-ton hoppers built in the U. S., are designed to meet the growing demands for large-volume coal movements to utilities, steel mills, and to lake and ocean ports.

The $12-million order for 1,000 of these cars was placed last March (RL&C, April 1960, page 37); production got under way in August. The car design is based on the AAR alternate-standard, outside-stake, 70-ton arrangement adopted some months ago. This 70-ton car was the result of a cooperative development program undertaken by the Chesapeake & Ohio, Norfolk & Western, and Pennsylvania. While all three roads are committed to the building of this standardize 70-ton arrangement when cars of this capacity are ordered, to date only the Pennsylvania has acquired them. First N&W order was for the 85-ton version of this car.

Since the rebuilding of the freight-car shop was started in Roanoke in 1956 (RL&C, Oct. 1957, page 21), the N&W has been utilizing these production facilities primarily for turning out 70-ton hoppers of its own design—N&W Class H-10. Over the past four years the Roanoke freight-car shop has produced 9,500 cars of




Cubic capacity of 3,235 cu ft for the H-11 car represents an increase of 307 cu ft over the 70-ton AAR alternate standard design. Car has 6½-x 12-in. axles, roller bearings, 36-in. multiple-wear wheels, and automatic slack adjusters.



Hydraulic riveter is used in the application of center fillers to the H-11 center sills.

Two-piece hopper assemblies, four at a time, are welded with automatic welding equipment.

Special tool is used to apply the hopper-door frames to the hoppers with Huck bolts.

five different types. The 85-ton Class H-11, which is 8 ft longer than the H-10, made it necessary to reduce the number of assembly-line stations from 20 to 17, and replace or modify most of the production jigs. The changeover time between the completion of the last 70-ton and the first 85-ton car off the assembly line was just under four working days.

In designing the H-11, it was decided that only four-wheel trucks could be justified in the quest for high capacity . The N&W began with 6½ x 12-in. journals, which allow an on-the-rail weight of 251,000 lb. It developed that not all N&W connections would accept a car with a gross weight of 251,000 lb. A car of 240,000 lb gross weight could pass through almost all N&W interchanges. Design work then proceeded with the aim of achieving maximum capacity within the 240,000-lb figure. It was because of this that the nominal 85-ton hopper emerged in place of the 90-ton car originally planned. The car has 6½ x 12-in. axles, roller bearings, and 36-in. multiple wear wheels. Large wheels reduce rail load concentrations.

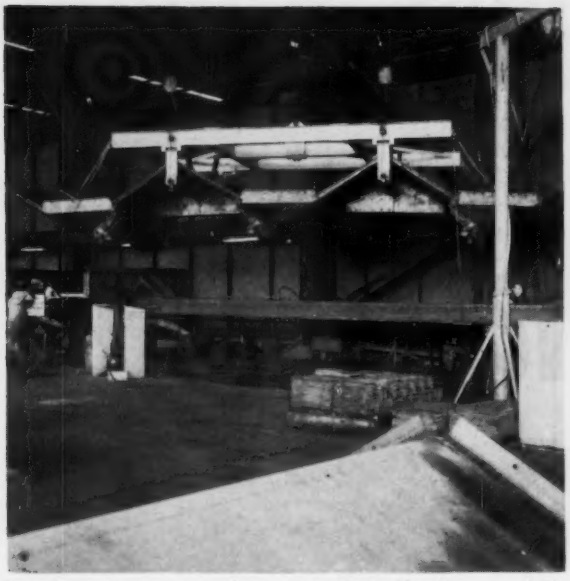
The 85-ton hopper which the N&W is constructing is an elongated version of the 70-ton standardized car. Plate thicknesses and structural sections in the two cars are the same. Most of the design features are duplicated. Increasing the length over strikers from 40 ft 11½ in. in the 70-ton design to 46 ft 1½ in. in the new design increases the cubic capacity from 2,928 cu ft to 3,235 cu ft, sufficient for the 85-ton rating.

The car is welded, with the exception of the riveting used on side stakes, top and bottom chords, center filler castings, strikers, and safety appliances. Riveting of sides assists in combatting damaging effects of car shakers. All interior joints are seal welded to prevent corrosion in the joints.

The car has a center sill formed of 41.2-lb AAR sections, and the top side and top end angles are 5- x 4½-in. bulb sections. Body bolsters are formed from 24-in. wide-flange beams. The two transverse ridges are supported by 16-in. wide-flange beams. Cast diagonal braces are used between the transverse ridges and the upper sides. The 26 side stakes are hat sections pressed from ¼-in. plate. The cars have cast-steel hopper-door frames. These frames are attached to the two-piece welded hopper chutes by Huck bolts and rivets. As with the standardized 70-ton car, the new cars have end floor sheets with a 42-deg 12-min slope from the end sheet to the bolster, and a 30-deg slope from there to the hopper openings. The upper floors are 5/16-in. plate and the lower floors and transverse ridges are ⅜-in. plate. Side plates are ¼-in. low-alloy, high-tensile, corrosion-resistant steel. In fact, all plates which contact lading are to be this LAHT material. The N&W is not using the higher tensile strength of the material to reduce the thicknesses of body components, but is keeping it at the same dimensions

**Suppliers of Equipment for 85-ton Hoppers**

Ajax-Consolidated Co.
Alco Products, Inc.
Allied Steel Castings Co.
American Brake Shoe Co.
American SAB Co.
American Steel Foundries
Armco Steel Corp.
Bethlehem Steel Co.
Buckeye Steel Castings Co.
Buffalo Brake Beam Co.
Chicago Malleable Castings Co.
Chicago Railway Equipment Co.
Crucible Steel Co. of America
Davis Brake Beam Co.
Ellcon-National, Inc.
Edgewater Steel Co.
Equipco Hand Brake Div., Union Asbestos & Rubber Co.
Enterprise Railway Equipment Co.
Hyatt Bearings Div., General Motors Corp.
Illinois Railway Equipment Co.
Keystone Railway Equipment Co.
McConway & Torley Corp.
Miller, Henry, Spring & Mfg. Co.
Miner, W. H., Inc.
Morton Manufacturing Co.
National Malleable & Steel Castings Co.
Railway Devices Co.
Schaefer Equipment Co.
Scullin Steel Co.
SKF Industries
Standard Car Truck Co.
Standard Forgings Corp.
Standard Railway Equipment Div. of Stanray Corp.
Standard Steel Works Div., Baldwin-Lima-Hamilton Corp.
Stucki, A., Co.
Symington Div., Symington Wayne Corp.
Timken Roller Bearing Co.
Union Asbestos & Rubber Co., Equipco Hand Brake Div.
United States Steel Corp.
Union Spring & Mfg. Co.
Universal Railway Devices Co.
Walker Machine & Foundry Corp.
Waugh Equipment Co.
Western Railway Equipment Co.
Wine Railway Appliance Co.
Youngstown Steel Car Corp.



Lower floors, hoppers, crossridges, and longitudinal hoods are completely assembled before being moved to the assembly line.

End assembly, complete with safety appliances and hand brake, goes on car following application of bottom assembly over center sill.

which would have been used with carbon steel. Result is predicted to be an appreciable increase in body life. The bottom of the carbody between bolsters is completely assembled before being brought to the production line. Other major sub-assemblies are the complete ends and the sides.

The light weight of the 85-ton car is 61,000 lb. With this weight, it is not necessary to use empty-load brakes. The car has standard AB 10 x 12 single-shoe brakes with automatic slack adjuster.

The N&W summarizes the advantages of its new design to include: lower first cost per ton of capacity; lower light weight per ton of capacity; shorter length per ton of capacity; reduction in periodic maintenance costs, such as repacking and repainting; savings resulting from reduction in number of units to be switched and handled; savings in accounting resulting from reduction in number of cars handled; reduction in number of units to be dumped at ports, and reduction in air-brake problems because there are fewer brake components and connections in a train.


Cars move down through the shop to a transfer table (left) and then back out on second half of assembly line which runs parallel to first half. N&W built this shop in 1956 and, since then, including current production, has produced over 10,000 cars there.

# Newest in Piggy-

# Rides on the latest ASF


New low profile
ASF Ride Control Truck
developed to order for
Pullman-Standard's new
Lo-Dek* Flat Cars.

ASF **Ride Control®**
**Truck**

*Patents applied for.

**AMERICAN STEEL FOUNDRIES...**

# -Back Flat Cars

# truck development!

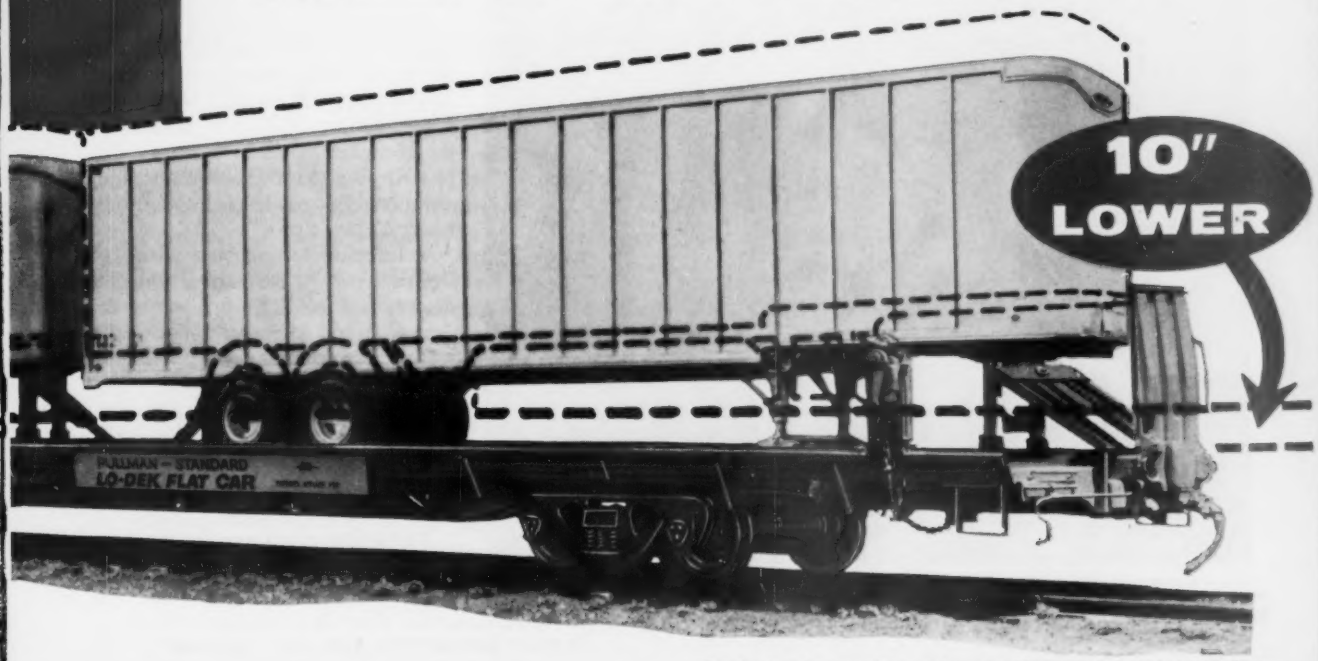
## Special ASF Ride Control® Trucks assure best ride for goods in trailers aboard the new PULLMAN-STANDARD LO-DEK* FLAT CARS.

Development of this novel car by Pullman-Standard was greatly facilitated through the co-operation of ASF specialists in the development of the truck while Pullman-Standard engineers concentrated on the car structure. The truck so developed is a low profile variant of the one that made modern high speed freight service possible, the ASF *Ride Control* Truck.

A host of outstanding advances in railroad equipment owe their existence to ASF research and engineering. Included are scores of modern improvements in trucks, brakes, couplers, and other railroad running gear components. Many of these "better ways," like the new low-profile ASF truck, were developed to order for projects which would not have been feasible without them.

In fact, the specialized research and engineering facilities which serve ASF so well are always available to help our customers solve their problems. Write direct for further information.

This illustration shows the Lo-Dek Car in comparison with the dotted outline of a standard 85 foot car . . . a height reduction of 10 inches. This substantial difference should aid materially in overcoming low clearance limits which have handicapped or prevented Piggy-Back development in some areas.




. . . . Prudential Plaza, Chicago 1, Illinois

Canadian Manufacturer and Licensee: International Equipment Co., Ltd., Montreal 1, Quebec
Other Foreign Sales: American Steel Foundries, International, S. A., Chicago

# PFE Expands Mechanical Reefer Shop

Steady expansion of the mechanical refrigerator car fleet of Pacific Fruit Express has been accompanied by an extension of the maintenance facilities for these cars. Pacific Fruit Express, owned jointly by Union Pacific and Southern Pacific, will be operating over 2,700 mechanical reefers on completion of the current car-building program at Los Angeles shops (RL&C, August 1960, p. 29).

PFE credits its success with mechanical refrigerator cars to careful periodic inspection and maintenance at all major repair points. Qualified personnel have been trained for this work. A major portion of the heavy repairs to power plants and cooling systems is handled at a central repair facility operated as part of the large PFE car-repair shops at Roseville, Cal.

The Roseville refrigeration repair shop was built in 1955 with a floor area of 3,200 sq ft, and in 1959 the building was lengthened an additional 60 ft, producing a total floor area of over 5,100 sq ft. A portion of this space is occupied by a parts storage area where a complete inventory of components for the mechanical equipment is maintained.

Engine repairs (foreground) and electrical repairs (rear) are important in reefer overhaul.

Cars which are to have their mechanical refrigeration equipment serviced or repaired are spotted on series of light and heavy repair tracks which are located throughout the yard.

### Shop Work Areas

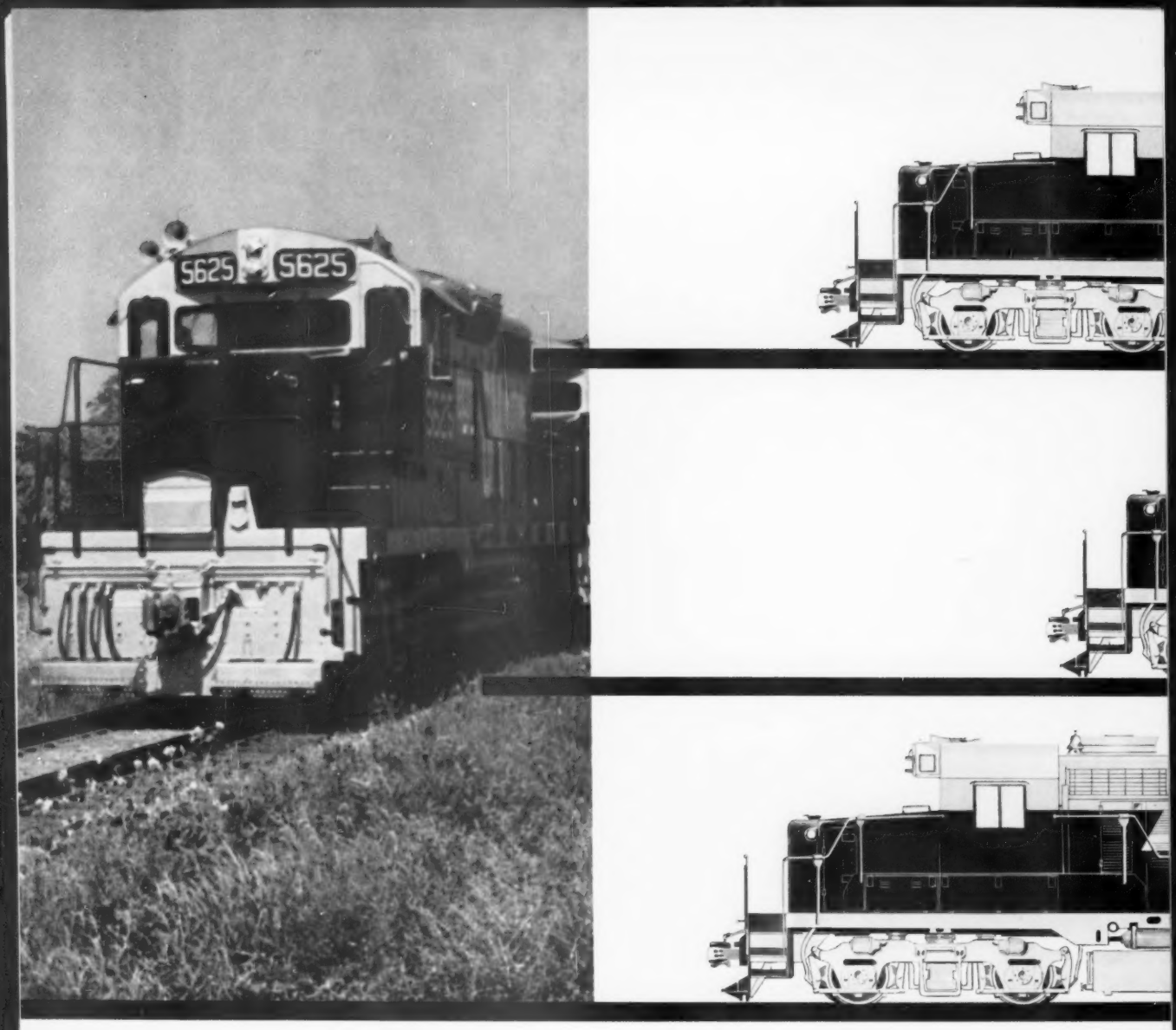
The shop is divided into the following work areas:

- Engine overhaul area which is fully equipped for all diesel work;
- Refrigeration overhaul and repair area equipped for repair and testing of compressors and similar components;
- Electrical repair shop where equipment such as starter motors, battery charging generators, voltage regulators, and batteries are serviced and repaired;
- Injector room, an air-conditioned area, where all fuel injection equipment is repaired and serviced;
- Combined tool room and cylinder head shop where pistons, cylinder heads and engine blowers are worked;
- Engine test room equipped with a load testing device for break-in of diesel engines;
- Drying room where refrigeration components are dried by electrical heat;
- Lube-oil testing area where oil from all cars in the yard is tested to determine if it is fit for further use and if any unusual engine conditions exist.

The shop is equipped with an electrically operated overhead hoist which can traverse the length and width of the shop and is capable of lifting 3,000 lb. The entire building has thermostatic-controlled heating, large window areas, and fluorescent lighting.

Tools and shop equipment have been developed for the overhaul of

*(Continued on page 35)*




# Three GP-20's will do the work of

## *and pay for themselves in less than five years*

**The locomotive replacement plan — more power with fewer locomotives.** The General Motors Locomotive Replacement Plan enables you to reduce the number of locomotives in your fleet while retaining or increasing total power. Three 2000 horsepower GP-20's will do the work of four 1500 horsepower locomotives while effecting important improvements in economy and efficiency.

**We pay you cash for your old locomotives.** Take a consist of four 1500 HP locomotives. Replace three of them with GP-20's. General Motors pays you about $40,000 per unit for your old locomotives. And since three GP-20's will do the work of four older units, you gain an extra locomotive with no increase in fleet size.

**You get a 10% reduction from new GP-20 price.** Certain long-life components from your old locomotives may be remanufactured and modernized, then incorporated in your GP-20's. You get new locomotive performance, warranty, and economy at well below new locomotive price.

# four of your present locomotives...

**Eliminate next major overhaul of old locomotives.** By proper timing of locomotive replacement, you avoid spending about $50,000 per unit by turning them in just *before* next major overhaul.

**Two important repair cost reductions.** When you replace three older locomotives, repair cost reduction is immediate and significant. And by eliminating one unit from the consist, you have permanently eliminated repair costs on this unit.

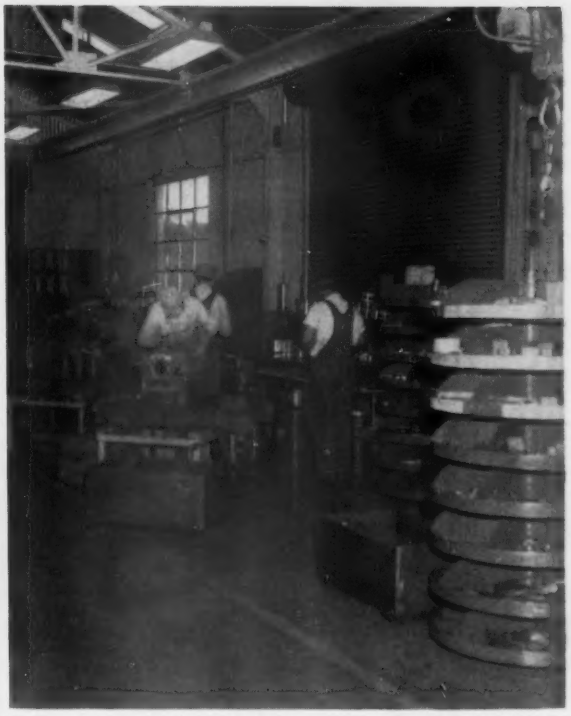
**Reduced fuel consumption means additional savings.** A three-unit consist of GP-20's is much more efficient than your four-unit consist of older locomotives. In fact, the GP-20's are more efficient than your older locomotives were when new. *Write your Electro-Motive Representative for more information.*

GENERAL MOTORS LOCOMOTIVES

GEARED TO PROGRESS P R I

**ELECTRO-MOTIVE DIVISION**
**GENERAL MOTORS**
LA GRANGE, ILLINOIS
*Home of the Diesel Locomotive*
*In Canada:*
General Motors Diesel Limited,
London, Ontario

Compressor repairs are handled in area which has been equipped with special tools and jigs designed for this specialized work.



Parts repairs are simplified with benches and with spare parts bins located so they are readily accessible to the workmen.

*(Continued from page 30)*

mechanical equipment, such as special stands that allow easy positioning of engines and compressors during overhaul. Special gear pullers for engine overhaul work have been developed by this shop.

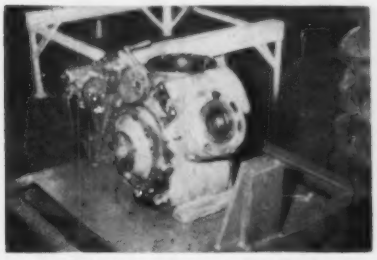
The area directly outside the shop has a large concrete cleaning area with tanks for degreasing and decarbonizing engines and engine parts. A crane facilitates moving and lifting of heavy parts into tanks. There is also complete equipment for steam cleaning of engines before disassembly.

### Shop Track Work

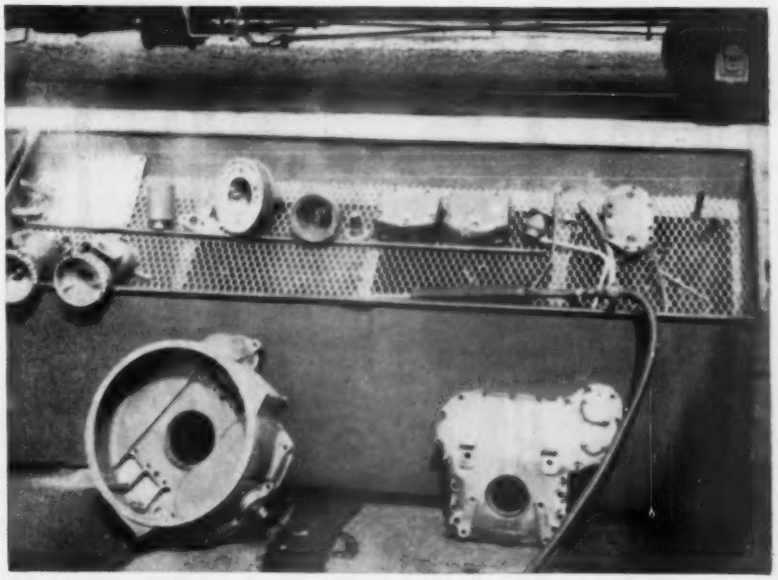
Not all work is confined to the mechanical shop area. Repairs and inspections are made on cars in the light repair yard which is made up of six tracks up to 6,500 ft in length. More extensive work, which involves holding a car more than one day, is handled on "heavy repair tracks" located throughout the yard for this purpose.

Transportation of repair personnel, tools and equipment to cars in the light and heavy repair areas is provided by a number of battery or gas-engine-powered personnel carriers. Transportation of heavy machinery, such as engines and refrigeration units, to and from cars for change out is handled by fork lift trucks dispatched from a central equipment pool.

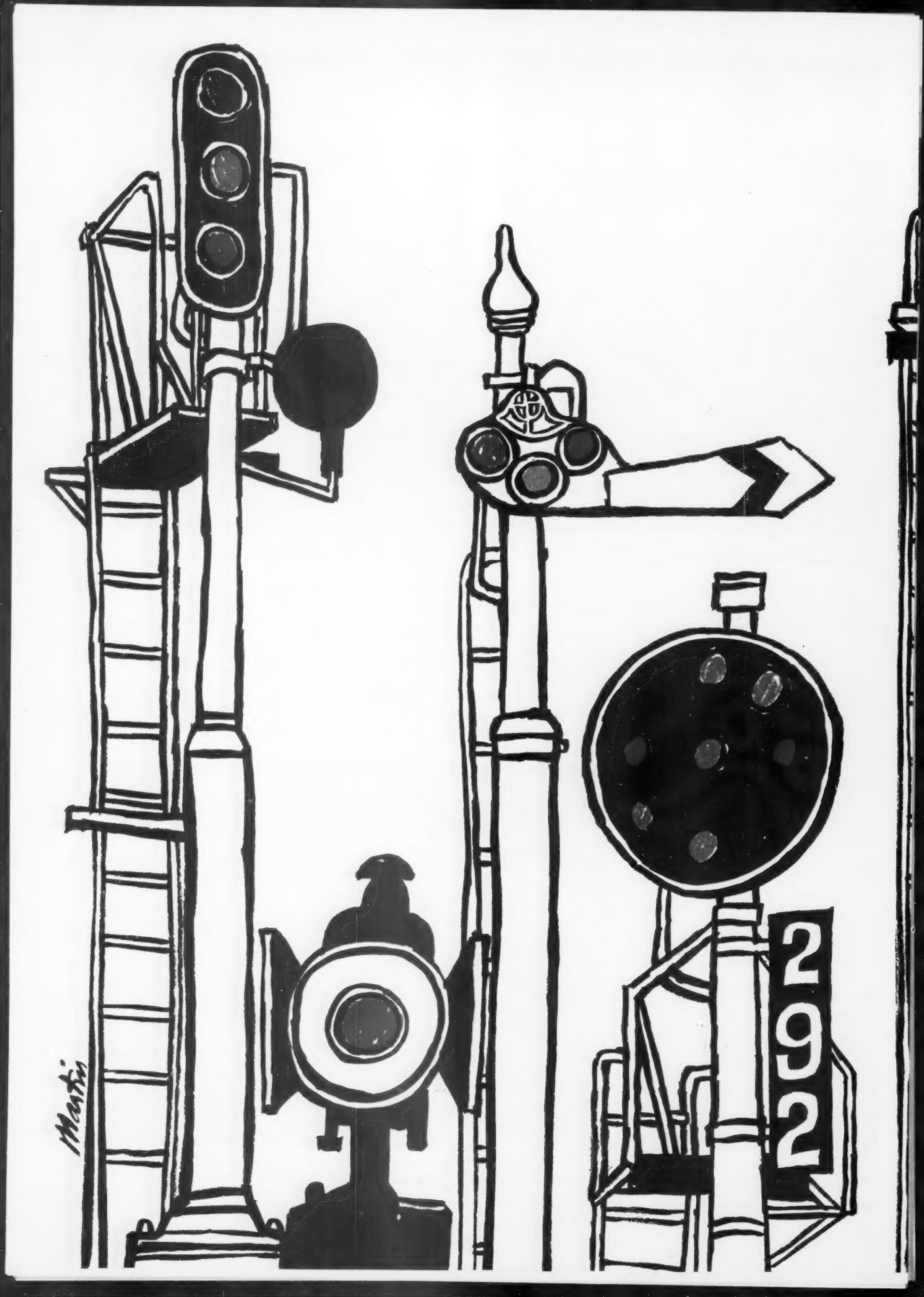
Roseville has always been an important point for all types of PFE maintenance and repairs.



Positioner makes it easier to handle the compressor bodies during repair.



Cleaning rack outside shop makes it possible to steam-clean engine and refrigeration components before they are sent through the shop for overhaul or reconditioning.


292

# METAL BRAKE SHOES HEED THE SIGNALS!

● When "the board's against him" the engineer must bring his train to a safe, sure stop—regardless of variations in weather, consist, or other conditions.

● For many years our metal brake shoes have been taken for granted in railway braking service. They have been taken for granted for one reason: they do the job so well. Dependably. Safely. And economically, too, when all costs are considered.

● Want facts? Just consult your Brake Shoe representative. Brake shoes have been our business for over 50 years. American Brake Shoe Company, 530 Fifth Avenue, New York 36, New York.

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**QUALITY PRODUCTS CUT YOUR TON-MILE COSTS**

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A-8182

*For Tomorrow's Trains . . .*

# Chicago Transit Tests New Trucks

Lightweight, high-speed, rapid-transit trucks are now undergoing tests in Chicago. The Chicago Transit Authority is operating five cars, each with a different set of experimental trucks.

For six months the cars will be operated in regular CTA trains for shakedown. After this, thorough tests will be made to determine the truck which gives the most satisfactory ride. This data, along with the first costs and maintenance costs, will enable CTA to select the truck for future transit car orders.

High-performance motors have been under test for five years. In 1955, CTA cars 6127 and 6128 were equipped with Westinghouse controls which incorporated series-parallel motor connections in place of the parallel arrangement used on other CTA lightweights which are similar to PCC street cars. The accelerator was an entirely new design with resistance contacts in a straight line instead of in a circular arrangement. Motors had the same outside dimensions and were mounted in the trucks the same way as the standard 55-hp PCC motor but were rated at 100 hp. They were designed for operation with 28-in. wheels and a 43-to-7 gear ratio. CTA installed them in B-4 trucks which were also equipped with ASF disc brakes.

At the same time cars 6129 and 6130 were equipped with General Electric motors and controls, similar in characteristics to the equipment on the other two experimental cars. The control was the MCM type, having two motor-driven cam shafts, one to make the circuit connections and the other to cut out resistance as needed. The 100-hp motors are operated in series parallel to get a high rate of acceleration and higher top speed. These motors are also mounted in B-4 trucks.

General Electric and Westinghouse cooperated in the control designs so that the two types of equipment could be operated in multiple satisfactorily. An automatic interlock, incorporated so high-speed, high-performance cars could be operated in trains with standard cars, keeps experimental cars in series and limits their top speed to 50 mph.

Numerous tests of the four cars have been made and top speeds of 76 mph were obtained on longer non-stop runs. For comparison with trains in regular service, the cars were also operated on an adjacent track. The high-speed cars demonstrated their ability to make possible faster schedules.

Four double-cab cars, numbered 1 to 4, which were ordered last year, and car 6127, one of the original high-speed cars, have been fitted with the special trucks. These high-speed cars which were used for the motor development program, have only single-cabs and must be operated in two-unit sets.

### B-20 Truck

Car 1 has B-20 trucks designed cooperatively by Transit Research Corp., General Electric, St. Louis Car, and the CTA. The design, similar to the B-3 truck which has given good results under standard cars, has springing, bolster snubbing and motor mounting arranged for high-speed operation. This B-20 truck has independent side frames held together by the axle housings which also tram the truck. Each housed axle, designed and built by General Electric, is powered by a motor which drives a gear mounted on a quill instead of directly on the axle. Drive between the quill and axle is through rubber. This eliminates the thrust bearing on similar axle designs previously used.

The bolster of the B-20 truck is carried on four small diameter coil springs, each consisting of two coils with a rubber cylinder between them. The bolster has boxes to hold conventional B-3 rubber snubber blocks as well as mountings for bolster anchor rods, making it possible to test both types of bolster control. Vertical motion is controlled by Monroe cylindrical shock absorbers, while Houdaille rotary units cushion lateral motion.

Motors are hung directly from the truck side frames instead of from a support beam used on the B-3 trucks. To test the need for rubber in the motor suspension system one truck has rubber motor mountings; motors are attached directly to the side frames on the other. Drive is through Spicer universal-joint shafts. The B-20 trucks have ASF disc brakes mounted on the pinion shaft of the axle unit instead of on the motor armature shaft. The 5 x 9 in. journal bearings and the pinion bearings were furnished by Timken. The trucks have standard CTA current collector beams, track brakes, and Westinghouse disc brake actuator.

### GSCC Truck

Car 2 has General Steel Castings Co. trucks of the same design used by the Cleveland Rapid Transit. The frame is a one-piece alloy steel casting. The bolster is carried on single-coil Pirelli springs with coils entirely encased in rubber. Hydraulic shock absorbers control vertical motion and Houdaille rotary shocks control lateral.

The GSCC trucks have open axles with SKF journal boxes in pedestals. Motors are carried on truck transom members which are part of the one-piece frame casting. Spicer universal-joint shafts transmit power to General Electric gear units, similar to those on the B-20 trucks. ASF disc brakes are mounted on the motor shafts. Lightweight equalizer bars have been added to the truck to provide unsprung supports for the track brakes.

### Pioneer Truck

Car 3 has Pioneer III trucks designed and built by Budd (RL&C, August 1956, p 49). This is a fabricated truck with independent side frames which clamp through rubber around the Timken journal bearing boxes on open axles. To relieve these journal bearings and axles from maintaining the tram of the truck, a triangular bracket terminating in a half sleeve is attached to each side frame. The two split sleeves fit loosely about a center post against which they bear when resisting forces which tend to untram the truck. This post carries none of the car weight, but otherwise functions as a center plate.

The swiveling portion of the truck frame has no springs. Air springs are

located between the car body and the bolster. The bolster rests on the truck side frames and transfers body weight through low-friction side bearings. A single pair of Houdaille rotary shock absorbers set at 45-deg angle controls vertical and lateral motion of air springs. A small air compressor with reservoir installed under the car body supplies air for the air springs.

The motors are close-coupled to the Dana gear boxes on the open axles. There are no universal-joint drive shafts. The drive end of the motor is bolted rigidly to the gear box through an intermediate housing that encloses the ASF disc brake. The motor shaft and gear-box pinion shaft are connected by a flexible coupling. The Westinghouse Air Brake actuator is fastened to the inside of the side frame opposite the disc brake, requiring a pull rod only a few inches long. One end of each motor is attached to the gear box; the other is supported from the truck frame by two hanger rods having rubber rings at each end. They are similar to bolster anchor rods. The body bolster was redesigned for the Budd trucks.

### B-30 Truck

Car 4 has B-30 trucks—another co-operative design by Transit Research, Westinghouse Electric, St. Louis Car, Dana, and CTA. This fabricated truck is a variation of the successful B-3 truck with an open, instead of a housed, axle. This eliminates three bearings in line.

Without axle housings to hold the truck in tram, two transoms are used to connect the side frames. One end of each transom is rigidly attached at right angles to one side frame and through rubber to the opposite side frame. These diagonal rubber connections allow flexing in much the same manner as the rubber in the diagonal axle housings of the B-3 truck. In the B-30 truck, side frames are clamped through rubber to all four Hyatt journal bearing boxes in the same general way as in the Budd truck. Open axles have Dana hypoid gear boxes and close-coupled Westinghouse motors like those used on the Budd trucks, ASF disc brakes are also similarly applied.

The free ends of the motors are hung on anchor-rods from the transoms. Wheel base is 6 ft 10 in. to provide access to the brushes. Motor mounting places the ends of the motors so close that there is insufficient space for the standard PCC king pin used on the B-20 and GSCC trucks. The B-30 truck bolster is designed to use a conventional shallow center plate and roller side bearings.

Bolster springs are the standard B-3 truck type, with an inner and outer coil spring and center rubber spring. The spring mounting incorporates the rockers and restrainers used on the B-3 truck. Monroe cylindrical shock absorbers control the vertical bolster motion, while Houdaille rotary shocks control the lateral motion. The bolsters are guided by anchor rods instead of wear plates or snubber blocks.

Weight of pilot truck, complete with motors, current collectors, etc., is 11,750 lb.

### LFM Truck

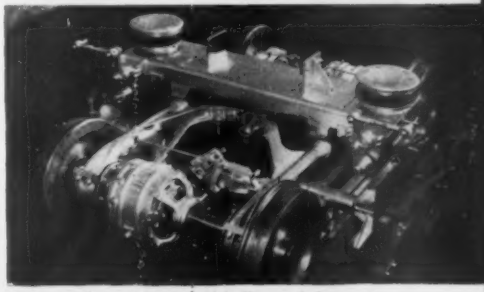
A fifth pair of experimental trucks supplied by the LFM Manufacturing Co., was to be delivered November 1 and placed under car 6127, one of the original high-speed cars. The LFM truck is an independent side-frame design with Timken journal boxes clamped in rubber. A single transom tube connects the side frames at their centers to maintain tram. To give flexibility, this attachment is made through rubber so the frames can rotate about the tube. Two crossties resting on rubber pads on each side frame carry the motors and, on the projecting ends, carry the bolster springs on articulated spring hangers. This gives a wider spring base than is possible when the springs rest directly on the side frames and is expected to reduce the tendency to roll. Bolster springs are the standard B-3 truck type with an inner and outer coil and a center rubber spring.

Lateral motion is provided by the swing links. The articulated spring hanger acts as a long link during low lateral accelerations. At high accelerations, the pendulum is blocked out and the two parallel links are free to move laterally to produce a higher restoring force.

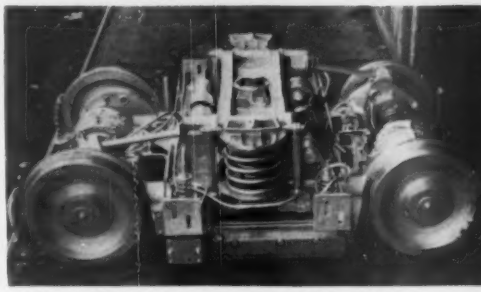
Monroe cylindrical shock absorbers control the vertical bolster motion. Provision is made for Houdaille rotary shock absorbers to control lateral if found necessary. Motors and ASF disc brakes from the B-4 trucks under car 6127 have been installed on the LMF trucks. The standard PCC king pin is used.

B-20 truck, with sleet scrapers, weighs 11,888 lb. Truck has 6-ft 6-in. wheel base. Housed axles are used.

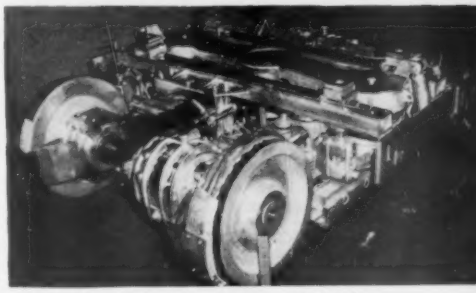
GSCC truck weighs 11,526 lb. and has 6-ft 6-in. wheel base. Truck frame is a one-piece casting. Open axles are used.



Budd truck weighs 10,700 lb. and has air springs which are used to adjust car height under loads. Wheel base is 6 ft 10 in.



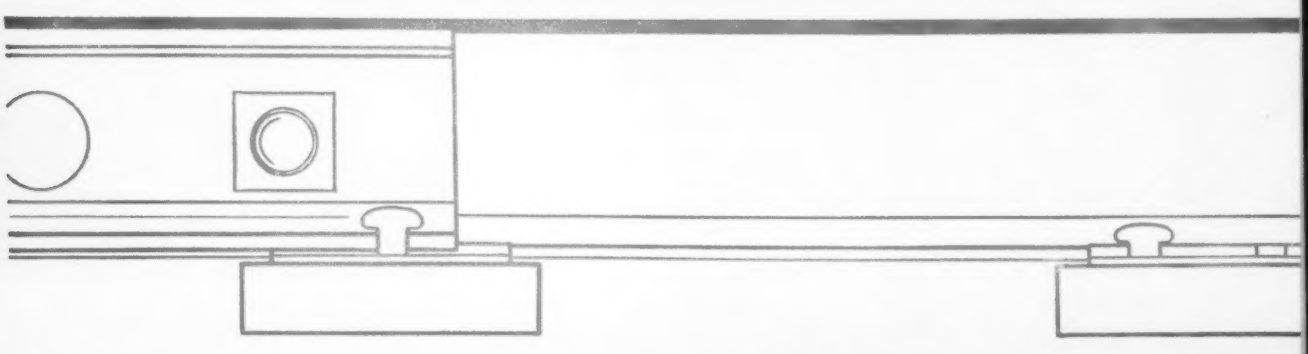
B-30 truck has a wheel base of 6 ft 10 in. and weighs 11,750 lb. Many features of original PCC B-3 trucks have been retained.



LFM truck, recently installed on car 6127, has single transom tube which maintains tram. Design gives wide base for springs.

# STOP HOTBOX DELAYS

## that result from Incorrect Lubrication



# Southern Wheel Shop Is Automated

## *Automatic conveyors and machine tools have been coordinated to supply system wheel needs*

Arrangement and operation of the Southern's automated wheel shop at Knoxville, Tenn., was described at the recent Car Department Officers' Association meeting by M. J. Hammett, manager of Coster shop at Knoxville. Five men in the wheel shop operate this facility which includes a series of automatic machine tools and conveyors for processing Southern freight-car wheel and axle requirements. (RL&C, April 1959, page 23.)

Mounted wheels are handled to and from Coster shop by 23 wheel cars on which wheels are loaded in two layers, giving a maximum of 38 wheel pairs per car. All the cars are identical; they were designed specifically for unloading by the automated unloader.

A rabbit between the rails moves a car into the unloading shed where it is spotted by pneumatic car stoppers. All controls for the rabbit and automated unloader are mounted in a single cabinet at the unloading shed. After starting the unloader, the operator goes about other duties. The unloader will unload 38 pairs in 58 min and then automatically shut itself down. The operator returns to pull the empty car out and move in the next load.

The carriage of the unloader travels over the wheel car until it "feels" a pair of wheels. It then stops, picks up the wheel set and places it on an adjacent track. When it makes the full trip over the car and finds no more wheels, it then returns to its starting point and shuts itself down.

From the track beside the car, the wheels are moved by an endless chain conveyor into an automatic washing machine which uses only cold, high-pressure water. After washing, the wheels are moved to the demount house. While they normally roll by gravity, this track also has a winch-drawn rabbit. This winch operates automatically and does nothing so long as there are at least two pairs of wheels outside the door awaiting the inspector. When there are fewer than two pairs of wheels, the rabbit will go back up the track until it can bring in the next five pairs.

Inside the demount house is the inspector who determines what will be done to the wheel set. He moves it into the inspection position by pushing a button and moves it out in the same manner after his inspection is complete. If the wheel needs only tread lathe or journal lathe attention, he pushes the proper button and an automatic wheel carriage takes the wheel to the proper track and returns.

Demounting requires a number of selections on a control panel. The inspector must push one button to channel the axle into the proper size tier. A four-tiered rack, each tier of which takes a different size axle, extends between the demount house and wheel shop. There is also an adjacent rack for scrap axles of all sizes. Axles are removed from the scrap rack by a fork truck and dumped into the scrap car. The inspector must also push the proper button to dispose of the demounted wheels.

The demount house is completely air conditioned for cleanliness and operator comfort. The single inspector handles 200 pairs of wheels in an 8-hr shift.

The second hand axle tiers from the demount house terminate inside the main wheel shop. The automated system is so designed that it is necessary to run axles of the same size on a continuous run. There are several blocks, stops, and limit switches which must be changed when going between the 5 x 9, 5½ x 10, 6 x 11, and 6½ x 12 sizes. At least one full shift is run on a given axle size and several shifts may run, depending on demand.

When the supervisor decides what size axle is to be run, the system is started and, thereafter, only axles from the selected tier will be fed into the system. The first stop after the axle feeds from the tier is a machine which comes into each end of the axle and cleans the centers. The axle is then conveyed automatically into a washing machine where it is cleaned by rotary wire brushes and a commercial detergent. After cleaning, the axle goes into temporary storage between the cleaning machine and the first conveyor.

The first, or A, conveyor serves the three automatic axle lathes. Each lathe has a storage space for four axles between the lathe and the conveyor. When the lathe takes an axle for machining, the conveyor receives a signal and picks up an axle from the washing machine storage. The washing machine then washes another axle to replace the one used. Naturally, the the whole shop is geared together so that each machine will just about furnish the needs of the next machine.

The automatic lathe is one of the most important parts of the entire system. An axle is automatically loaded into the lathe from the lathe storage and then "probed." This is accomplished by a bracket holding several templates closing in against the journal and wheel seat. The location of the templates is automatically set by the size of the surfaces to be machined and then automatically locked into place. A stylus then follows the contour of the templates and thus reproduces the desired machined surface on the axle. Three cutting tools are used—one for the end collar, journal and fillet; one for the dust-guard surface and fillet; and one for the wheel seat. These tools cut in succession, not simultaneously. The wheel-seat tool automatically removes .030 in. The dust-guard tool automatically removes .020 in. The journal tool removes only as much stock as is necessary to clean up the journal up to a maximum of .045 in. If the .045 in. cut will not clean the journal, then the tool cuts down to the next step size. For a 5½-in. journal, it will cut down to 5⅜ in. A single operator, the second man in the shop, changes the tools on all three machines.

Cycle time on the lathes is 9 min. 40 sec. This would give a maximum of 48 axles per 8-hr shift per machine. Actually, allowing for tool changes, the lathes produce about 40 axles per 8-hr shift, or a total of 120 per 8-hr shift for the entire shop.

*(Continued on page 56)*

*LMOA Committee Reports . . .*

# Diesel Reclamation Pays Its Way

Reclamation of diesel parts is important in controlling inventories and reducing maintenance costs, the Committee on Diesel Material Reconditioning and Control reported at the recent meeting of the Locomotive Maintenance Officers' Association. Railroads have been successful, with the assistance of suppliers, in developing reclamation practices which are economical and which increase the life of diesel parts. Two reclamation processes most frequently employed are welding and metallizing. Both oxyacetylene and electric arc welding involve high temperatures and the deposit of metal under conditions where heat input cannot be a factor affecting the basic characteristics of the metals involved. The second process—metallizing spray—has wide application for specialized reclamation procedures. While oxyacetylene welding produces temperatures to 6,300 deg F and electric arc welding to 7,000 deg F, temperatures developed during metallizing spray are only in the 200 deg F range.

Metallizing spray process basically borders on a cold procedure and results in a mechanical bond of similar, as well as dissimilar, metals. The process guards against contamination of the steel alloys used in certain diesel parts. It protects against changes in physical characteristics of the basic part as a result of heat application.

The metallizing spray process is not adapted to the reclamation of diesel parts where shock is a factor; it does have application to the reclamation of items subject to heavy load and rapid wear. The ability to replace a worn area with a metal more durable and resistant to wear than the original metal actually increases the service cycle of some reclaimed parts, the Committee reported. This can be accomplished at a fraction of the cost to manufacture the part of material equally wear resistant.

Railroad reclamation with the metallizing spray processes involves the deposit of bronze, molybdenum, stainless steel, and low-carbon steel. Other metals which can be applied by this method include babbitt, brass, copper and nickel.

Metallizing spray equipment is generally available on most railroads. Initial equipment costs are moderate, permitting rapid return on the investment with a well-organized reclamation program and steady flow of work, the committee stated. Selection of materials exceeding service requirements can result in excessive material costs. Heavy metal deposits should be avoided. Close attention should be paid to finish machining or grinding and to reduce rejects.

Reclamation of the Alco 244 cylinder liner water jacket is an example of effective use of metallized spray. Rapid erosion of the water jackets made frequent replacement necessary. A two-step metallizing procedure was developed which restored the part to serviceable condition.

The jacket to be reclaimed is placed in a lathe and area extending from the end back through the area of corrosion and fretting is machined out to a depth of .005 to .010 in. for application of the Sprabond material. One minute of bonding molybdenum is sprayed on as a bonding medium, followed by spraying for 25 min with stainless steel. After being built up with stainless steel, the water jacket is placed in an internal grinder and ground to a finish dimension of 10.433 in.

Cost of a new jacket would be $52, the committee said. Stores costs would bring this to $55 or $60. Reclamation costs include $12.96 for labor, $1.30 (10 per cent of direct labor) for nonproductive labor, shop expense of 25 per cent — $3.57, making a total of $17.83. Life of this part is doubled. A saving of 78 per cent is, therefore, realized for the reclaimed item, it was concluded.

Alco jacket to be reclaimed will be placed in lathe and corroded area will be machined.

Machining to a depth of 0.005 to 0.010 in. readies the jacket for metallizing process.

Grinding of the sprayed stainless produces a jacket which is ready for reuse in engine.

Reclamation of the lower crankcase seal area of the water jacket can also be performed by metallizing at a cost of $10.10. To do this, ½ min of bonding molybdenum is sprayed on, followed with 5 min of bronze, then finished to dimensions. Compared with the cost of a new water jacket, it represents a saving of approximately 80 per cent.

L. H. Sultan, SP, reported that the Southern Pacific is following the process described in the report as applied to lower liner areas, but has not found it necessary for upper parts. Reclamation cost for the lower area of a water jacket, it was said, is about $10. The Erie was reported to be using stainless-steel water jackets with the hope that they will double service life.

L. H. Booth of the C&O, who presented the report, said the cost of reclaiming a jacket was $17.83 as compared with $52 for a new one. P. J. Finch, C&O, asked about difficulties experienced in fitting stainless-steel jackets, and C. L. Hall, NYC, said that it did not involve any particular difficulties and that it may be done twice.

The Alco air compressor crankshaft, Westinghouse part 524995, can be reclaimed by metallizing the worn oil seal surface. With handling charges, the cost of this shaft new is approximately $275. Labor necessary for reclamation is $5.36, which includes $3.90 productive labor, $0.39 nonproductive labor, and $1.08 shop expense. One-half minute of molybdenum spray followed by 3 min. of low-carbon steel spray are required. Material cost of $1.07 plus $5.36 for labor brings the total reclamation cost to $6.43. Savings represent approximately 97 per cent of the replacement cost.

### Piston Carriers

On one road, piston carriers for EMD Model 567 B engines condemned for wear at the upper and lower pilot seats are reclaimed by metallizing at a total cost of $10.83. This compares with $25 for a new carrier, a saving of approximately 44 per cent. After the piston carrier is degreased and magnetically tested for cracks, the lower edge and thrust washer surface are coated with anti-splatter paint and two pilot seats are ground under size to give a clean surface. This operation is done in an engine lathe which is also equipped with a Metco metallizing spray gun.

The pilot seats are then sprayed with molybdenum Sprabond to give a thickness of approximately 1/32 in., giving a hard, durable wearing surface. The carrier is wire brushed to remove any stray splatter and then the pilot seats are ground to size. Finish sizes are 5.966 in., plus .000 in., minus .001 in. for the upper pilot, and 7.485 in. plus .000 in., minus .001 in. for the lower.

On another road, Gardner-Denver air-compressor cylinders used on EMD locomotives are reclaimed and returned to service by metallizing. These cylinders, after being degreased or thoroughly cleaned, are placed on a vertical turret lathe and rough bored to .090 in. oversize, using a carboloy-tipped tool. The feed on the machine is set at .033 in. at 25 rpm, which will leave a rough thread cut to insure a good bond during metallizing.

A 36-in. lathe is used to spin the cylinders while metallizing with the feed set to .032 in. at 280 rpm. The cylinders are bolted to the face plate for this operation. A 44-lb counterweight is attached when metallizing duplex cylinders for balancing purposes. The machine used for this operation has a hollow spindle, on the end of which is attached a 6-in. metallic hose connected to an exhaust blower to carry off fumes and excess metallizing splatter.

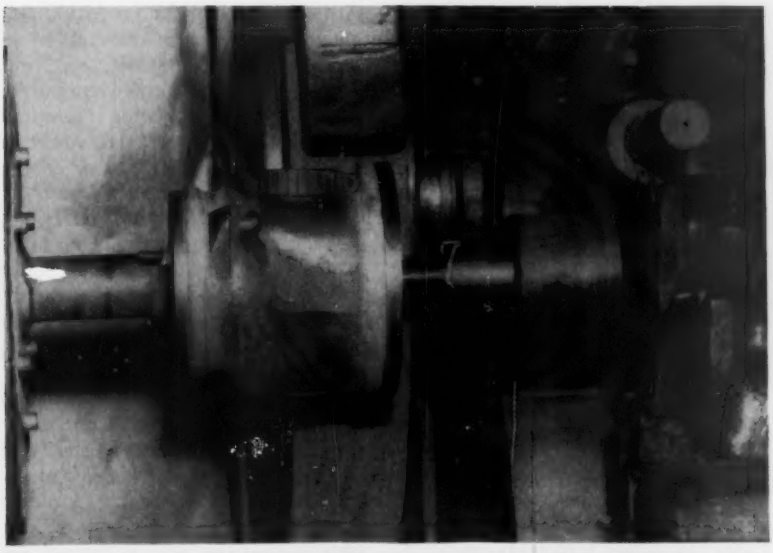
Using a type 4-E Metcoloy spray gun, ⅛ in. dia., Sprabond wire is applied to a thickness of .003 in. for a bonding metal. Metcoloy No. 2 size 11 wire is then applied until the cylinder is approximately 1/16 in. undersize. The metallizing is done with the oxygen pressure set at 33 lb and acetylene pressure at 15 lb.

After the cylinders are metallized, they are bored on a vertical mill to .003 in. undersize, using a .011 in. feed at 13 rpm with a suitable cutting oil to prevent tearing. The cylinders are then finished on a honing machine.

### Vee Belt Pulleys

The machining of Vee pulleys without causing objectionable changes in speeds was reported by one road during the discussion. It is the practice in some shops to build up Vee pulleys by metallizing, and it was reported that it is only necessary to prepare the pulley surfaces with a wire brush without machining. Mr. Booth of the C&O said his road had experienced no trouble with peeling and said pulleys might also be prepared by sandblasting. One member said he had trouble with peeling on bronze pulleys but none with non-shrink metal. When asked about the effect of shocks on sprayed metal, O. A. Lange, B&O, said he had one failure out of 800 cylinders. Replying to a question, Mr. Lange said his road had not had failures of metallized cylinders because of scoring.

The advantage of spraying over welding was questioned. In reply, it was said that welding involves high temperatures and that it disturbs the physical characteristics of the parent



EMD piston carriers are reclaimed by metallizing on one road. Here the carrier is set up for the grinding of pilot seats following the application of the molybdenum spray metal.

metal. Metallizing, it was said, involves only low temperatures and may be used in places where there is high wear.

This indicates the wide scope of metal-spray applications for reclaiming diesel parts. In many cases, roads have gone to metal spray or welding to provide wear or bearing surfaces prior to condemnation so reclamation costs would not become excessive.

### Diesel Valves

One road is reclaiming worn Alco 539 and Baldwin 600 valves by applying a hard facing coat of Thermospray 160 powder which resists burning and wear. The worn valves, after being checked for other defects, are ground undersize to provide a true surface. They are then blasted with a G-25/40 angular steel grit to produce a good bonding surface. The valves are then preheated to 350 deg F. It was found that expansion which occurs after spraying on cold valves may cause the coating to crack. About .005 in. of self-fluxing Thermospray powder is applied to protect the surface from oxidation during subsequent heating. Using an acetylene torch with a soft flame, the valves are heated to a cherry red. Thermospray powder 160 is then sprayed on until the valve is brought to size. The valve is heated to approximately 2,000 deg F (about white heat) until fusion occurs, when the Thermospray coating will assume a glossy appearance. The valves should be immediately buried in powdered asbestos so cooling will take 8 to 16 hr, when valves will be ready for grinding.

The cost of valve reconditioning is $12.50 each. New Alco valves cost approximately $18.50, and Baldwin prices are $26.32 for the exhaust valve and $20.27 for the intake valve. The railroad using this process removed one set of valves after 30 months' service and reported them to be in perfect condition. Ten Alco 539 engines and one Baldwin switcher have been equipped, and no failures are reported.

### Welding Crankshafts

Another example of experimentation that can produce savings for the railroad industry is fusion welding of damaged locomotive crankshafts by submerged arc welding (RL&C, Mar. 1960, p. 33). This was developed by the Texas & Pacific. J. O. Fraker, T&P reported his road has welded 34 shafts. The method, he said, is not applicable to shafts which are broken in two. Of the 34 crankshafts welded, 20 are still in service. The work was started with manual welding and was later made automatic. One repaired shaft has operated 443,000 miles. Mr. Fraker said that this process is used for building up undersized shafts and that shafts are subsequently chrome plated. He said that all journals are made to the same size and that it is not practicable to weld one journal because of effect on alignment. When a crankshaft is welded, he said, it must be rebalanced.

### A-Frame Repair

On one road, the straightening of EMD "A" frame main bearing pedestals caused by heavy impacts on the engine is performed without removing the engine from the carbody. It was found that a severe impact on the EMD engines could result in the bending of the No. 6 main bearing pedestal. This causes unequal wear on the thrust and main bearings and could, if sufficiently severe, result in crankshaft damage. As a precaution, all units receiving severe impacts are ordered to the shop for inspection.

After the crankshaft is jacked up tight into the upper bearing, the No. 6 bearing cap is removed and a plastic strip is placed in the bottom center line of the bearing cap. The cap is reapplied and torqued to valve on the main bearing studs. After this, the cap is removed and the plastic strip taken out and "miked" to show deflection.

Thrust bearings are then removed from No. 5 and No. 6 main bearings, the crankshaft lateral moved toward the front end of the engine, and the upper and lower main bearings sections removed. A special split bushing is then rolled into position and the bearing cap reapplied and pulled up snug on the studs. A micrometer measurement is then made across the outside machined faces of Nos. 5 and 6 "A" frame pedestals. Dial indicator strain gages are placed between Nos. 6 and 7 pedestal faces on each side.

After this preparation, special rails which are built to receive and support the heads of two journal jacks are inserted through the crankcase inspection holes between Nos. 4 and 5 main bearings. The other rail is applied through Nos. 3 and 4 main bearings, both rails being supported by ½-in. machine bolts through the web of the rails and into brackets over the bottom edge of the air box. Jacking pads are then inserted and the journal jacks applied. The bearing caps are then reapplied to torque on the pedestals.

The No. 6 "A" frame pedestal is moved by the jacks about three times the amount of deflection indicated by the reading from the plastic strip and shown by the strain gages. If the plastic strip indicated a deflection of .007 in., the total movement by jacking as shown on the strain gages would be .021 in. The strain gages are removed; the pedestals are tapped heavily with a soft hammer, the strain gages are reapplied, and the readings are rechecked. After these are checked and there is found no variance in the readings, remove the No. 6 bearing cap and record the strain gage readings. The other equipment should then be removed, main bearing shells reapplied to the Nos. 5 and 6 positions, and the crankshaft raised tightly against the bearings.

With a lead gage strip in the bottom of Nos. 5 and 6 bearing caps, reapply the caps and torque to proper value. After this, remove the caps and measure the lead strips with micrometers to determine if the No. 6 pedestal has been returned to proper alignment. There is no heat used on this reclamation at any time.

One of the most promising processes of recent months is ceramic coating of combustion chamber parts such as heads, pistons crowns and valves. This process is the mechanical bonding of a flame ceramic sprayed on the parts by a technique developed by the Armour Research Laboratories. Ceramic coatings have a thickness of approximately .008 in. Coating prevents the heat of direct flame of combustion in the cylinder from being transmitted to the metal. This prevents heat checks caused by unequal heating or cooling in heads, pistons and valves.

The heat barrier provided by the ceramic produces lower engine lubricating oil temperatures, resulting in less oxidation. Heat retained in the combustion chamber improves combustion. Tests on some railroads have shown an increase of 55 hp per unit. Others have reported fuel savings of 3 to 5 per cent.

During discussion, G. F. Bachman EJ&E, said that a few years ago motor support bearings were being reclaimed by rebabbitting, and W. C. Gage, Milwaukee, said his road is doing it on

*(Continued on page 55)*

# Regulator Has No Moving Parts

To eliminate the periodic maintenance associated with moving parts and contacts of conventional voltage regulators, General Electric has developed a static regulator. Reliability of semi-conductor and magnetic components led to their utilization in this device. Any voltage regulator must control charging currents to insure long battery life, to protect the auxiliary generator, and to obtain best performance from the locomotive control system. To date, experience with these static regulators substantiates expectations of their high reliability.

Previously, General Electric had utilized the basic principles of this new device in its excitation control for the Union Pacific 8,500-hp gas turbines (RL&C, March 1959, p. 44) and in its wheel slip-slide detection system (RL&C, May 1959, p. 49). The UP locomotives have now operated over 8 million miles in revenue freight service without semi-conductor failures or excitation system maintenance.

The new voltage regulator modulates the field of the charging generator in response to output to produce a constant charging voltage, regardless of battery load or condition, until the generator's current capacity is reached. Current is then limited to prevent overheating of the generator.

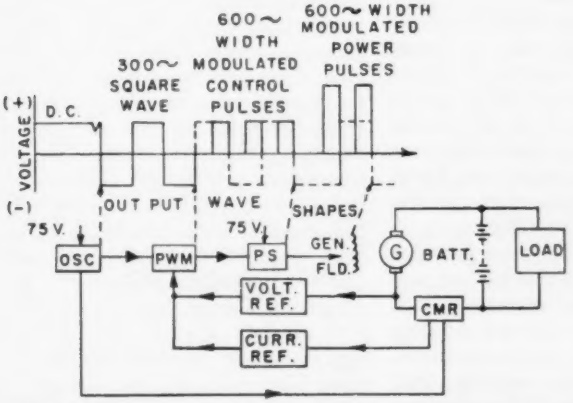
A properly applied semi-conductor amplifier can satisfy the above conditions. In their simplest form, these systems use the transistor as a variable resistor, either in series with the field or in parallel with it, if an external current limiting resistor can be used. These systems are generally straightforward and utilize the transistor as a class A amplifier. Their power handling capacity, however, is seriously limited. For example, in the straight series class A regulator, the total field power is limited to four times the maximum power dissipation of the transistor. For a present practical design, using commercially available power transistors operating in industrial ambients with convection cooling, this limit would be 40 watts of field power. If the transistor is used as a shunt, this capacity is further reduced.

Regulators using the class A design have been designed for rapid transit application where the generator capacity is in the order of 1 to 3 kw. Because the generator capacity in the majority of locomotive applications falls in the 5 to 25-kw range, the field power is far in excess of 40 watts and means must be found for extending the power handling capacity of the transistor. The transistor displays an almost ideal switch characteristic; i.e., the current and, hence, the power dissipation, when non-conducting (biased off) is very low. Also, the voltage drop and power dissipated when conducting (biased on) is very low. Furthermore, it is possible to modulate the field power by controlling the "on" time of the transistor switch with respect to the "off" time. This control (called pulse-width modulation) permits the control of field powers up to 1 kw and enables a single regulator to cover all locomotive battery charging applications. The repetition rate of the switch in such a system, however, must be high to prevent a voltage ripple. This ripple, in addition to causing objectionable lamp flicker and other possible problems in the locomotive control system, could substantially affect battery and generator life and maintenance. Therefore, the regulator design here described was based on a switching frequency high enough to insure smooth regulation while maintaining adequate thermal rating in the transistor switch.

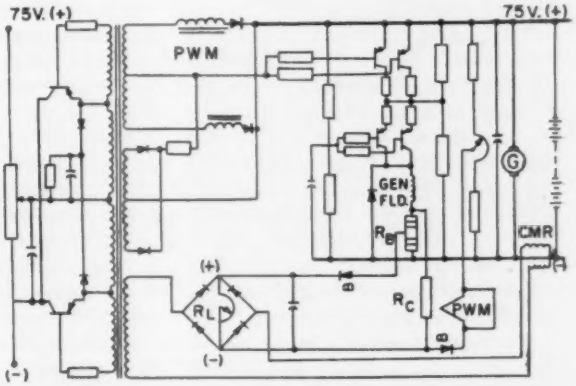
The basic magentic amplifier control includes these basic functions:

- An oscillator power supply which furnishes 300 cps square-wave power for control of the magnetic amplifier and the armature current measuring reactor.
- The amplifier, which contains the pulse-width modulator (PWM) and power switch (PS), modulates generator field current in proportion to the

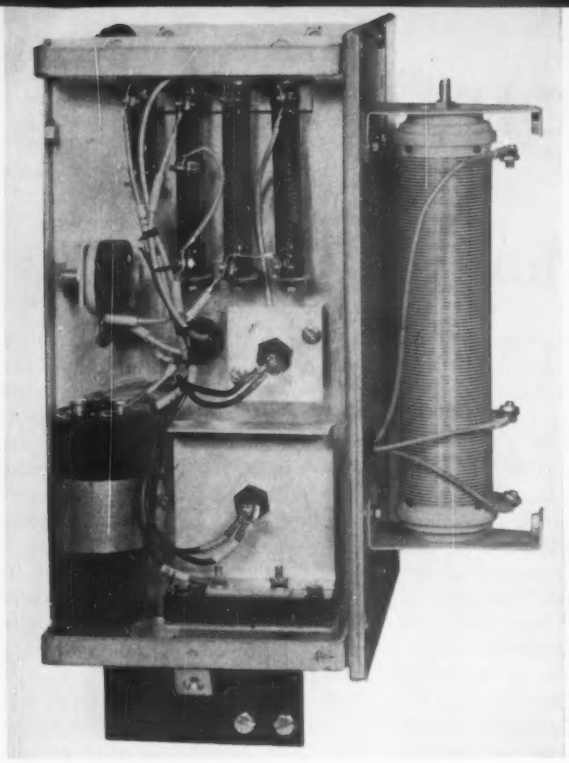
From a paper presented by R. K. Allen and W. B. Zelina, Locomotive and Car Equipment Department General Electric Co., before recent meeting of Land Transportation Committee, AIEE, at Atlantic City, N. J.




Block diagram of system shows relation of the oscillator power supply (OSC), pulse-width modulator (PWM), and power switch (PS).




Schematic of entire regulator indicates how actual individual function circuits are arranged with respect to each other.



Regulator is a compact unit. Three component cards—the oscillator power supply, transistorized power switch, and amplifier and control circuits — can be removed and replaced with new units which require no adjustment before regulator is again placed in service.

feedback signal from system voltage.

• Control circuits — voltage, voltage reference, and current limit — receive signals from the armature current measuring reactor (CMR).

• The armature current measuring reactor produces a control signal proportional to the generator armature current.

The regulator has been designed with these functions incorporated on removable component cards. The armature current measuring reactor is mounted separately from the regulator frame and is easily detached. One componet card contains the oscillator power supply. The transistorized power switch, together with the associated heat sinks, is packaged on another card. A third card contains the amplifier and control circuits.

The oscillator consists of a saturable transformer with a transistorized switching circuit connected into the primary. It inverts a 16-volt, d-c input obtained from a voltage divider connected across the 75-volt supply to 300 cps square-wave output. Voltages developed in the three secondary windings are used for various control functions. Secondaries 1 and 2 supply the amplifier, and secondary 3 supplies the current measuring reactor.

The power switch is used to control the input to the generator field. It consists of four power transistors — two in series and two in parallel — which supply discrete pulses of power to the generator field in response to the signal from the PWM.

The armature current measuring reactor performs the function of a d-c current transformer and supplies a low current output signal proportional to armature current. It consists of two toroidal reactors assembled on a bus bar which carries armature current.

The voltage control circuit receives a feedback signal from the regulated voltage through a divider, and compares this against the reference element. Any difference in voltage produces a current flow through the control winding of the PWM to modulate the generator field. This changes the regulator voltage so that the error signal is at a minimum.

The voltage signal is obtained across the voltage sensing circuit. A portion of system voltage is compared against the voltage reference, a 5-volt zener diode. If the voltage at the potentiometer arm exceeds that of the zener diode, current flows through the PWM control winding to turn off or reset the flux in the magnetic amplifier.

The current limit control provides an overriding feature that reduces regulated voltage when a preset armature current is exceeded. This gives a constant power limit to protect the auxiliary generator. The current limit circuit receives a signal from the armature current measuring reactor. This signal appears as a d-c voltage and is then compared to the current limit reference, which is a 7.5-volt zener diode. When the armature current increases in sufficient amount to give a signal greater than 7.5 volts, current flows in a direction to reverse the polarity on current limit coupling resistor $R_c$ which then acts as a decreasing reference in the voltage control circuit. As the total reference voltage decreases, the amount of turn-off control current through the PWM control winding increases. PWM decreases field current and system voltage.

The more the armature current exceeds the cut-in value, the larger the current through the coupling resistor $R_c$, resulting in further decrease in system voltage.

These circuit elements have been proportioned so that the current limit control gives approximately constant power output from the auxiliary generator. For example, an 18-kw generator with the current limit cut-in at 240 armature amperes would have a regulated voltage of 75 volts. When the armature current exceeds 240 amp, the regulated voltage drops in such proportion that approximately constant generator power is available until battery voltage (approximately 64 volts) is reached. The current limit cut-in point may be adjusted.

The current limit signal is introduced through a portion of the compensation resistor to ensure a uniform current cut-in point regardless of the field current or generator speed. The two turn ratios provided by the taps on the current measuring reactor permit maintaining constant current limit characteristics for generators ranging from 5 to 25 kw in size.

Certain features of static systems differ from mechanical systems. The transistor switch, unlike its mechanical counterpart, cannot dissipate system-generated energy pulses in the form of arcs. Care must be exercised to orient the complete system so that semiconductor elements are not subjected to damaging voltages resulting from system-generated transients. This can usually be done with little or no difficulty.

Like other static systems, this regulator employs the functionally independent packaging philosophy. Experience indicates that this simplifies both trouble shooting and maintenance. It also provides sub-function assemblies which are interchangeable without the need of regulator adjustment or testing.

# *Two Grounds Equal One Failure*

By Gordon Taylor

Electrician Bill Sparks had just returned from a vacation trip to the West Coast. Like the postman who went out for a walk on his holiday, Bill had spent some of his vacation visiting a diesel shop on a coast railroad. Bill was now telling some of the high points of his trip to one of his pals.

"They had a case of diesel trouble that was different from the usual run of trouble that we have experienced," he said. "The first day two GP7 units that had been involved in an accident were brought into the shop. These two units were being used as a multiple-unit locomotive and were pushing a string of cars into the dock yard.

The engineman who had been operating the two units brought them to the shop. "There is something really wrong with the control system on these units," he told the diesel house foreman. "If I have opened the throttle to No. 4 position, there is no trouble in reducing engine speed back to idle when the throttle lever is moved to Idle position. If I move the throttle to No. 5 position, then it is not possible to bring the engines to idle by moving the throttle lever to Idle.

"This got us into a lot of trouble down at the dock this morning," the engineman continued. "We were pushing a string of cars into the dock yard. When I tried to slow the locomotive, it continued to push with the engines at No. 5 throttle even though the throttle had been closed. Before I could bring the train to a stop, we had knocked down a bumping post and badly damaged two cars. It was only by depressing the Emergency Stop Button on the throttle lever and moving it to Stop position that I brought the locomotive to a complete stop with the aid of an emergency brake application. Now, it is up to you shop people to give me a locomotive that I can control."

At this point Bill Sparks asked his friend, the foreman, if he could observe their methods of shooting trouble. "Sure, stick around," the foreman replied. "Maybe both of us will learn something new."

The foreman called a couple of electricians and said, "We have the job of finding what is interfering with the throttle control of engine speed on these units. Current must be by-passing the throttle drum contact that ordinarily completes the circuit to the BV solenoid in the governor. I say the BV solenoid because it is first energized in fifth throttle position and is supposed to be de-energized when the throttle lever is moved back to fourth, or lower, positions. Let's find that sneaky by-pass circuit. It could be a case of 'grounded' control wiring, so we will start checking for control grounds."

Starting at the positive connection at the battery, it was soon found that the positive wire from the battery was indeed grounded. It took some time to discover that chafed insulation on the wire connecting with the battery charging receptacle beneath car-body floor had established a rather poor ground.

The next question: Where was the other ground causing the control current to by-pass the throttle drum contact and energize the BV contactor? At that point, one of the electricians testing the circuits said, "Here's a $64 question—If there is a by-pass circuit around the throttle drum, why won't it cause trouble right at the start? Why does it have to wait until the throttle is moved to No. 5 position and then start by holding the BV solenoid in a closed circuit?"

"We may answer that question when we find the other side of the sneak circuit," the foreman said. "In the meantime, let the ground remain on the battery charging receptacle so we can prove our work when we find the other ground which must be causing our trouble."

A close check was then made of BV wire leading from the throttle drum into the 27-wire control cable that is protected by conduit most of the way through the unit. It was found that BV 12 wire was grounded where it emerged from the conduit, but the ground connection was not a very good one. There was enough resistance in the imperfect ground connections at the charging receptacle and in the BV wire in the cable so not enough current would pass to pick up the BV contactor when the throttle was in Idle po-

This series of articles is based on actual experiences of men who operate and maintain diesel-electric locomotives.

sition. When the BV contactor had been closed by moving the throttle to position 5, the sneak current would hold the contactor closed to maintain engine speed even though the throttle was moved back to Idle. Tests confirmed the cause of the trouble. It was corrected by using insulating tape and by rearranging the wires so the insulation would not be chafed.

Bill's friend listened with great interest, and then asked, "Bill, I wonder how we have missed having that kind of trouble?"

"That is easy," answered Bill. "You will understand when you think how our foreman, Doc Watts, insists that we keep our control circuits free of grounds. Old Doc knows it is easier to prevent trouble than it is to run it down and repair it later.

"When a diesel control system becomes grounded, it has taken its first step on the road to trouble. The next and final step occurs when a ground appears on the opposite side of the circuit and blows a fuse or opens a circuit breaker. However, there are other grounds that cause troubles worse than blown fuses. When two positive grounds are situated so they by-pass current around one of the regular control devices, it is possible to energize a contactor which should not be energized. Now," said Bill, "are there any more questions?"

"Yes," said his friend, "I'd like to know if there was anything else the engineman might have done to stop the locomotive without having to shut the engines down?"

"That's a good question," Bill said, "and here's the answer. Always remember that the locomotive's power depends not only on a running engine, but on a main generator that is excited enough to supply current to the traction motors. If the generator fields are not excited, the traction motors are powerless, regardless of diesel engine speed. The engineman could have cut off locomotive power immediately by opening the Generator Field switch located right at his control station."

As Doc Watts would say, it takes an excited main generator to operate a diesel locomotive, but the excitement should stop right there. The engine crew should never become excited. To keep engine crews calm, provide them with dependable units. That calls for dependable diesel maintainers and a thorough preventive maintenance program.

*(Continued from page 8)*

provided by the running boards. UTL pointed out that many high running board tank cars now in service have no handholds in the area under dispute and that a handrail would be easier to grip than the edge of a wooden or steel grating running board, particularly when there is snow or ice. It should not be particularly subject to damage—another RLEA contention.

Although Union Tank contended that neither side rails nor side running boards are necessary for the protection of men on the ground, examiners, following the latest hearing, have found "insofar as men on the ground are concerned, a side handrail such as proposed affords as much protection against stumbling and falling towards or under the car as is afforded by the side running boards on a conventional low running board tank car." The modified HD car may well have passed its last legal hurdle.

## AAR Seeks More Attention for Solid Bearing Journals

Application and lubrication of freight-car journal bearings should receive greater attention, according to the AAR Mechanical Division. Section IV, par. (i), of the Lubrication Manual requires that journal-box oil be applied both to the inside and to the back of the wedge and also to the inside of the bearing when applying or replacing a bearing. When a bearing, particularly the new H-type, is applied or replaced, it should be pushed back so that it contacts the journal fillet. It should be held in this position while the wedge is pulled forward to the wedge stop, and this condition maintained as the load is returned to the truck or journal-box assembly.

Undue wear has been found on the end of the journal bearing at the collar location because, in most cases, of improper application of the bearing as well as failure to apply oil on top of the journal bearing so that end pressures can be relieved by free sliding of the contact surfaces at top of bearing and bottom of wedge. Rough surfaces on the pad on top of bearing and bottom of wedge should be removed. A recent check of 124 H-type bearings removed from cars indicates ten had given trouble because they had not been pushed in far enough when applied and were allowed to run with the end of bearing riding up on the collar of the journal.

The Mechanical Division suggests that each road conduct a campaign at its shops and repair tracks to educate forces in the proper application of journal bearings.

## Lubricator Appications Continue to Increase

Journal lubricators had been applied to 1,057,821 railroad-owned freight cars, or 56.9% of the 1,858,746 railroad-owned cars, by June 30, 1960. On that date 143,687 privately-owned cars, or 52.1% of the 275,406 in this class, had been equipped. The total for both classes was 1,201,508

cars, or 56.2% of the 2,134,152 total ownership.

The latest figures on the performance of waste-packed and pad-equipped cars are shown in the table.

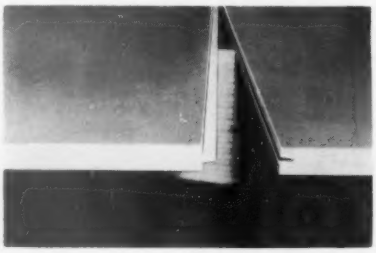
| | Cars set off between terminals with hot boxes, Total | Miles per car set off |
|---|---|---|
| July 1956 | 21,721 | 133,813 |
| July 1955 | 24,551 | 113,573 |
| July 1957 | 29,257 | 96,064 |
| July 1958 | 23,173 | 108,822 |
| July 1959 | 20,654 | 128,643 |

| Year 1960 | Pads | Waste | |
|---|---|---|---|
| Jan. | 2,329 | 5,887 | 324,954 |
| Feb. | 2,261 | 5,549 | 323,155 |
| Mar. | 2,566 | 7,429 | 274,195 |
| Apr. | 1,900 | 10,296 | 223,494 |
| May | 1,846 | 11,210 | 213,342 |
| June | 1,795 | 14,934 | 159,354 |
| July | 1,945 | 16,540 | 136,076 |

The AAR Mechanical Division has recently notified member roads and private car owners that the Committee on Lubrication of Cars and Locomotives has granted conditional approval to the Southland and the Utility journal lubricators. This brings to a total of eight the number of conditionally approved pads as previously listed in Supplement 1 of the AAR Interchange Rules. Lubricators with conditional approval listed therein included Hennessy Lube-Pad lubricator, Journapak journal lubricator, Optimum journal lubricator, Rolin journal lubricator, Spring-Pak journal lubricator, and Uni-Pak journal lubricator.

## What's New

*(Continued from page 15)*



Both sides are laminated with ⅛-in. tempered hardboard made to PFE specifications. The panels are manufactured to 1¾ in. thickness and are then tongued and grooved. An adhesive placed in the tongue and groove during assembly creates a completely tight, waterproof floor. The panels are delivered to Los Angeles in box cars from the Diamond Lumber Co. plant in Tillamook, Ore. *Diamond Lumber Co., Dept. RLC, 323 Pittock Block, Portland 5, Ore.*

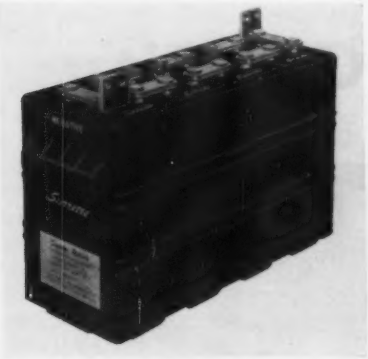
### Insulating Material

Nopco Lockfoam is a urethane plastic foam with exceptional insulating qualities (K Factor .13) that can be poured into place as a liquid mixture. The subsequent foaming, as chemical reaction proceeds, expands the plastic so that it entirely fills a mold with a low homogenous solid. The panels thus obtained can be drilled, sawed, milled and sanded. The material is said to have none of the disadvantages of fibre glass or polystyrene foam; will not flake or dust, and is virtually unaffected by moisture. At present, it is being used in refrigerated trailers. *Nopco Chemical Co., Dept. RLC, North Arlington, N. J.*

### Drain Can

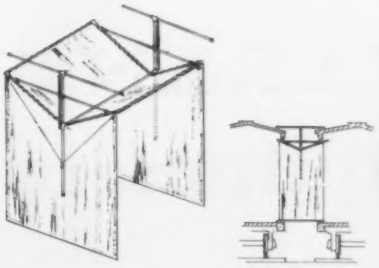
A can for draining flammable liquids from industrial drums, crankcases, and other containers has a seamless body drawn from one-piece, 24-gage terne coated steel. The body

and breast are electrically welded under electronic control. The top of the can has a large funnel with a wide opening and perforated metal fire baffle to guard against flame or spark igniting the contents. It can easily be removed for emptying or cleaning the can, which has been approved by Associated Factory Mutual Fire Insurance Companies. *Eagle Manufacturing Co., Dept. RLC 2994 Charles st., Wellsburg, W. Va.*



## Batteries for Diesel Locomotives

The Rezistox grid construction of the Surrett battery is said to make possible 40% more cell plate surface. Containers are rubber Monobloc, with triple insulation. Plate edges are sealed with Polyethylene on all sides. Capacities range from 341 to 496 amp hr at 8-hr rate. Specific gravity is 1.250. *Surrette Storage Battery Co., Dept. RLC, Jefferson ave., Salem, Mass.*

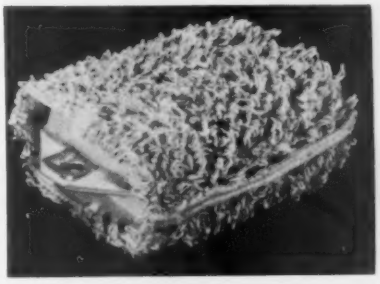


## Portable Weather Guard

The Between-Car-Weather guard is a rigid, lightweight aluminum frame, covered with Fro-Prene nylon. It fits between wood or steel box cars, regardless of height or width of doors, or distance between cars. It is set in position from floor of car, without the use of tools or clamps, and instantly becomes "self-locking" and self-supporting with tension springs and framing. The inverted V-top frame gives maximum overhead protection and controls dripping from car roofs. Water drainage will be to either side, well away from car doors. Side curtains fasten securely inside the car. *Frommelt Industries, Inc., Dept. RLC, Dubuque, Iowa.*

## Blast Cleaning Abrasive

Pangborn G, a blast-cleaning abrasive, is reported to last up to 2½ times longer than malleable abrasives, although not as long as premium grade steel shot. Speed of cleaning is said to be faster than the lower hardness malleables; the same as the harder malleable abrasives, but less than steel of higher hardness. *Pangborn Corp., Dept. RLC, Hagerstown, Md.*



## Journal Lubricator

The Atlas journal lubricator has all-cotton lock-looped fabric over a nitrile foam core and features center feed wicking. The ends are recessed for minimum collar and fillet wear. The lubricator is said to hold 4½ pt of oil in a saturation test and 3½ pt both in wicking and feed tests. The device is AAR approved for test application in interchange. *Beck & Blatchford Corp., Dept. RLC, 80 East Jackson Blvd., Chicago 4.*

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## Diesel Reclamation

*(Continued from page 46)*

freight units but not on passenger units. Mr. Snow, L&N, spoke of the current trial of nylon inserts for motor support bearings, and representatives of other roads reported that they were being used both on new and reclaimed bearings with good results. A representative of the Rock Island told of using six sets of nylon inserts in passenger service and reported that they wore well if the brasses were not loose.

K. F. Miller, P&LE, asked if the use of high-dome pistons would cause bearing difficulty and also asked for information on ceramic coatings for pistons and heads. Mr. Booth expressed the opinion that it would be good for 539 engines, but would probably necessitate rebuilding the engine. Mr. Snow asked how many railroads are reclaiming pistons by rebanding, and Mr. Hall said the work was being done in NYC shops.

A representative of the Continental Coatings Corp. said that metallizing may be done on aluminum as well as on cast iron. K. F. Miller, P&LE, said that ceramic coatings have served to increase horsepower and have worked satisfactorily. W. E. Seagraves, Santa Fe, asked for the condemning limit for 539 cylinder liners. Mr. Snow replied that no liner can be put back if it shows more than .035 in. wear—that it will cause smoking and broken rings.

W. E. Lehr, LV, said that shop operators must know what they are saying when they talk about reclamation. When forces are reduced and it is felt that reductions are more than they should be, they must be able to prove it. They must know, he said, what a job is going to cost when it is done in the shop and must be good salesmen when attempting to sell reclamation to management. Mr. Hall added that reclamation of some engine parts should not be done. The opinon was also expressed that it is very hard to make labor reductions and then to have parts costs increase, apparently destroying reductions made by improved methods. If such cost increases can be shown, it was said, it would serve well toward maintaining a stable labor force.

Mr. Lehr concluded the discussion by saying it is of first importance to maintain standards of reclamation. If poor work causes loss or failure of reclaimed parts, the savings claimed by reclamation will not be realized.

## Southern Wheel Shop

*(Continued from page 43)*

The arrangement serving the burnishing machine is similar to that serving the axle lathes. A temporary storage ahead of the machine holds five axles. When the burnisher takes an axle out of this storage, the second, or B, conveyor takes an axle from storage from one of the lathes and takes it to the burnisher storage.

The burnisher, like the lathes, is an end-drive Sellers machine. It is completely automatic and, so long as there is an axle awaiting burnishing and a place to put the axle after burnishing, it will load itself, burnish the axle, and unload the burnished axle into temporary storage between the burnisher and the third, or C, conveyor. The burnisher is geared to the output of the three lathes which it serves and completes a cycle in a little over 3 min. The Southern requires a burnished finish of 12 micro-inches, and this is maintained with no difficulty. Usually, the journal finishes run about 10 micro-inches. Now these are spot checked with a Surfindicator, but a machine which will automatically check the finish on every axle is on order.

Down the line from the burnisher is the third man, an inspector who gives each axle a thorough inspection before wheels are mounted on it. When this inspector is ready for an axle, he pushes a button which signals the C conveyor to bring an axle from the burnisher. Between the conveyor and the inspection station is an automatic machine which checks each journal ultra-sonically. If this machine should detect a flaw in the axle, it signals the inspector. Otherwise, the axle is automatically conveyed into the inspection station.

The inspector checks every part of the axle and finally puts a wet magnetic particle test on the axle. If there are no defects, the inspector pushes one button and the axle is automatically moved down to the D conveyor where it awaits mounting of wheels.

After moving from temporary storage, the D conveyor transfers the axle into the measuring station. Along with the probing system of the automatic lathes, this measuring system is the real heart of the system. The axle is picked up and the machine "feels" each wheel seat to determine its size. This information is then electronically

transmitted to two Betts 54-in. boring mills, each of which bores a wheel for one end of the axle. These boring mills automatically load and unload themselves. They load from a roller conveyor running outside the house, which is kept full by the fourth man in the system operating a fork truck. There is a roller conveyor for each mill, and they are so interlocked that wheels can be loaded only in pairs. This is to insure that wheels with tapes which do not match cannot be loaded.

After the mills machine the wheels, they are unloaded into roller conveyors which move them down to the press. They are set up in the vertical plane by shop built "tip-up" machines, receiving coatings of white lead on the wheel fits in a machine also built at the shop. Then they roll into the press. In the meantime, as soon as the boring mills have discharged the bored wheels, the measuring station releases the axle and it also rolls into the press, also receiving a coat of white lead.

The press is completly automatic and mounts the wheels on the axle one after the other. The pressure gages and recording tape are located in the center of the shop at the console which is overseen by the fifth man. After the press has mounted both wheels, the pair is discharged out an automatic door in the wall and then each journal receives a coat of rust preventative from an automatic machine. The wheel set is discharged onto a wheel carriage which moves it to one of 23 storage tracks. The storage track is selected by the console operator who pushes a button which makes the carriage take the finished wheel pairs to that track until another button is pushed, or until the tracked is filled, giving an alarm buzzer and red light to the console operator. If a wheel pair should fail to fall within the proper limits, the console operator pushes a "Reject" button.

The console operator is the most important man in the entire system. He monitors the operation of all machines by signal lights on the panel board in front of him. In addition, he has complete control over the boring mills and can alter the signal sent to the boring mills by measuring stations. If he sees pressures running consistently high, he can make an adjustment to cause the mill to take out just a little more metal. Conversely, he can cause the mills to take out a little less metal if required.

STATEMENT required by the Act of August 24, 1912, as amended by the Acts of March 3, 1933, July 2, 1946 and June 11, 1960 (74 Stat. 208) showing the ownership, management, and circulation of

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5. The average number of copies of each issue of this publication sold or distributed, through the mails or otherwise, to paid subscribers during the 12 months preceding the date shown above was: (This information is required by the act of June 11, 1960 to be included in all statements regardless of frequency of issue.) 6,216

C. L. COMBES
Signature of Editor

Sworn to and subscribed before me this 28th day of September, 1960.

[SEAL]

ANN BITONDO
(My commission expires March 30, 1961)


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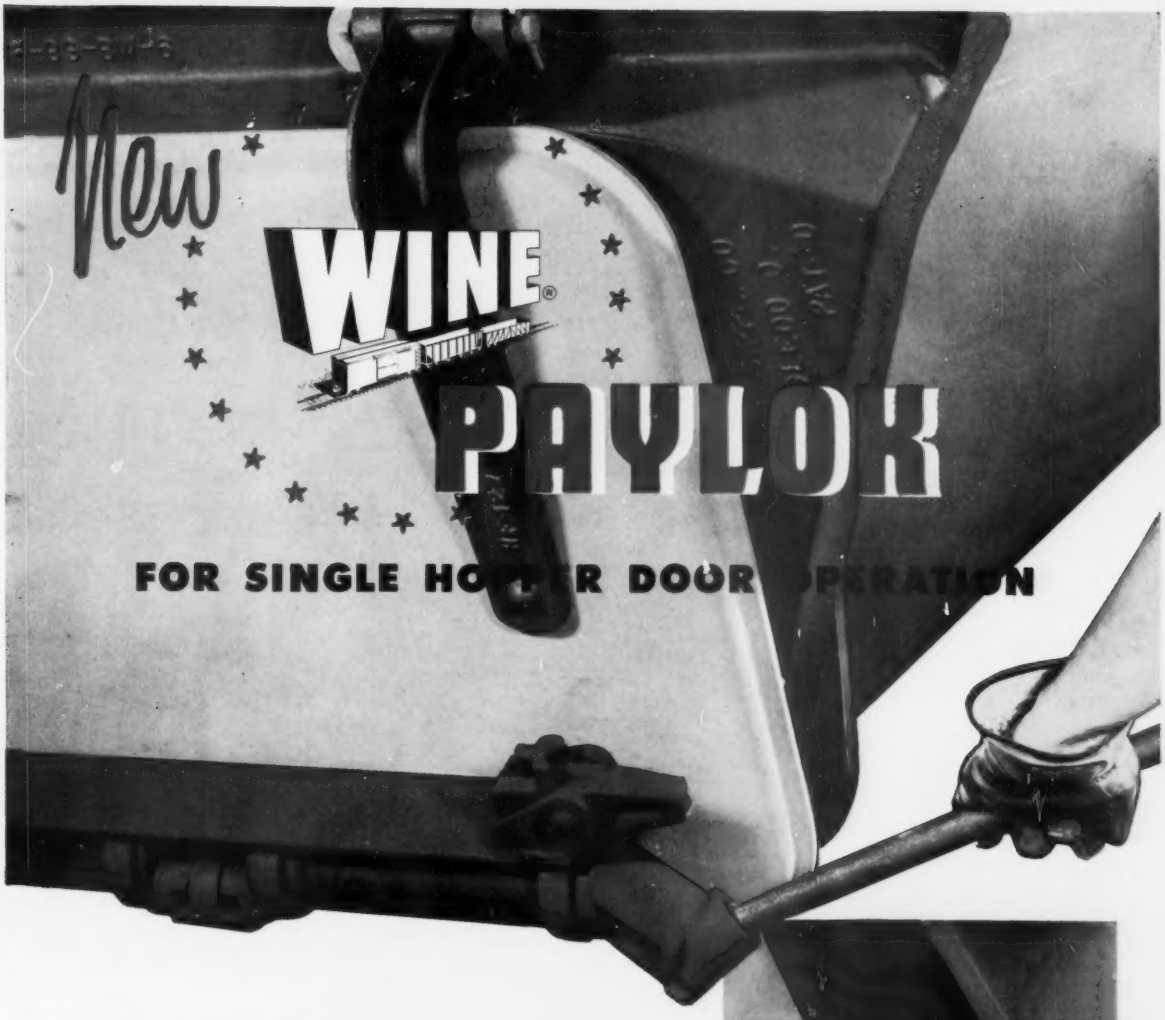


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**Can be turned on both flange and tread to restore full contour. (Minimum 1¼" back rim.) • Special-design parabolic plate distributes stress evenly. • All present standard AAR gauges can be used. • New design permits greater wear while retaining long sweeping fillets under flange and rim for greater strength. • Only two tape sizes. (Actually, most Griffin Wheels are within two half tape sizes!) Perfectly round as cast . . . no machining required. Tolerances are accurate to 20 thousandths of an inch.**

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